The Iron Age

A Review of the Hardware and Metal Trades.

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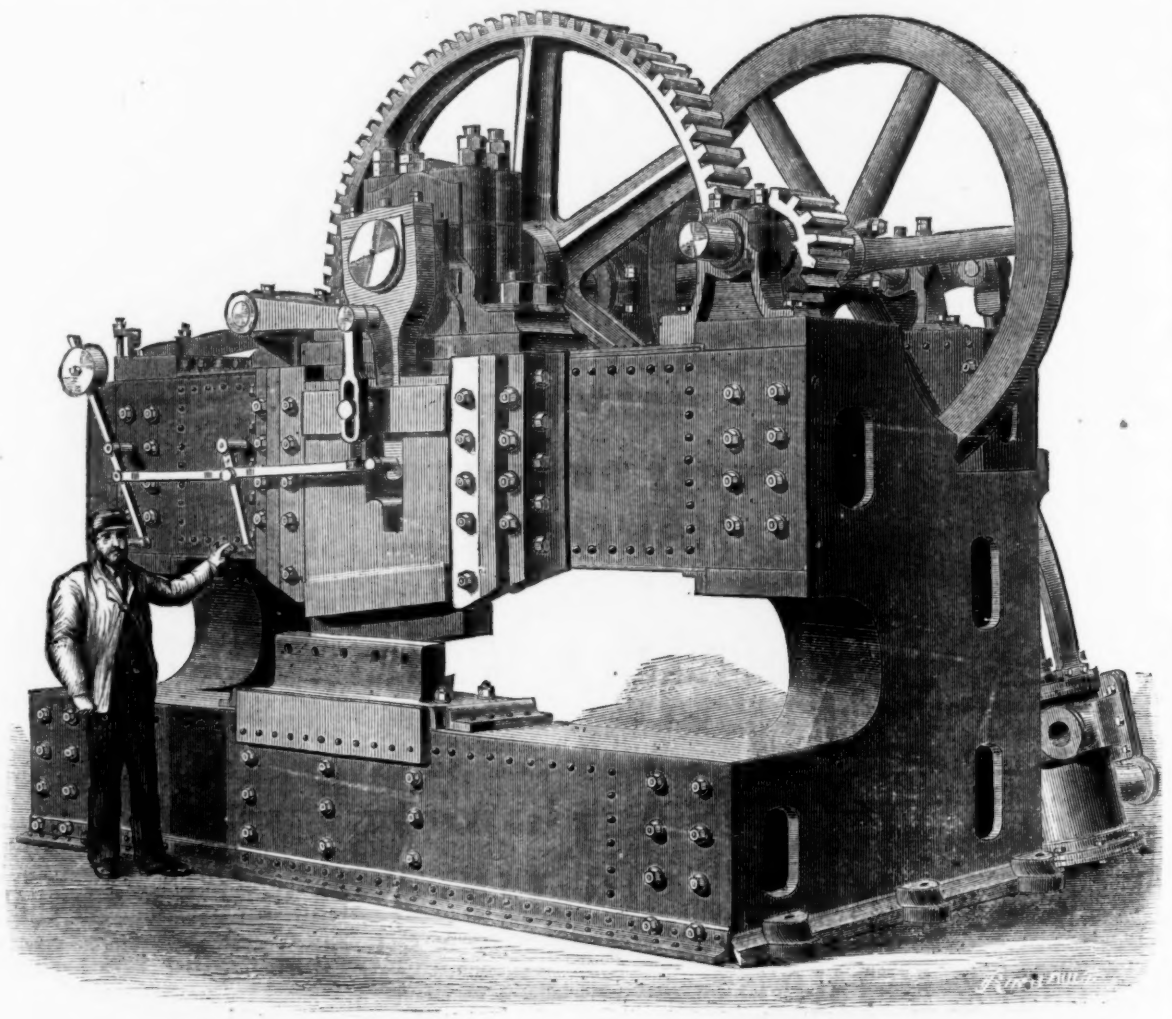
Mammoth Shearing Machine.

The accompanying illustration represents a scrap shearing machine of unusually large size and strength, constructed at Mulheim on the Rhine, Rhenish Prussia, by the Friedrichs-Wilhelms-Hutte Iron Company, a firm which is best known in Europe through its extensive foundry for water and gas pipes, some fine examples of which are exhibited at the Vienna Exhibition, in the pavilion for the iron and mining industry of Rhenish Prussia and Westphalia. This foundry of the Friedrichs-Wilhelms-Hutte turns out work to the amount of about 30 tons a day, and produces pipes up to 13 ft. long, and 3 ft. 6 in. diameter; the engineering works belonging to the same company supply chiefly machinery for iron works and mines.

The shearing machine we now illustrate consists, as will be seen from the engraving, of two strong hollow cast iron uprights, connected by three box girders made of wrought iron plates and angle iron, the two upper girders carrying the bearings of the engine shaft, and of the main shearing shaft, as well as the guide for the shearing slide, whilst the block for the fixed shear is supported by the lower girder. The two uprights are curved as shown, and there is between them a clear space of 11 Rhenish feet (about 11½ ft. English), so that not only the edges of plates can be conveniently cut, but even the plates can be cut entirely through across their whole length. Plates as thick as 1½ in. can be sheared in this machine. At the side of the machine a small pair of shears is fixed, driven by an eccentric and a lever, and being principally used for the cutting up of the waste pieces from the large plates, so that these waste pieces may be made into piles for blooms.

The total weight of the machine is about 41 tons, and several of the pattern shown have been built for large rolling mills in Westphalia and Rhenish Prussia. The first machine of the type was constructed for the well-known works of Messrs. Schulz, Knaudt & Co., of Essen.



SCRAP SHEARING MACHINE.

Wheeler's Combination of Iron and Steel.

This important achievement in metallurgy has but lately been made known to the public. It embraces the most complete mechanical union of distinct surfaces, and also the working up of iron and steel thus combined into tubular and other forms more perfectly and cheaply than ever attained before. The chief features of this invention consists in the method adopted to prevent the "burning" of the steel by excessive heat before it can be welded to or combined with the iron. This is accomplished by the simple expedient of protecting the steel on all sides by encasing in a close box of iron, in which it is brought to a welding heat at the same time with the iron, and subsequently passed between the rolls. The hollow axle of this combination is produced from a hollow pile, on the same principle, by piling one about the other sectional tubes of iron and steel in their desired order, in such a manner as to break joints, heating the same to the welding heat, and then cementing the several joints and sections by passing through the rolls, without employing a mandrel or other internal former. It is clearly possible by this process to produce an axle which shall have a varying internal diameter, since it is only necessary in piling the sectional tubes preparatory to heating, to place at the parts of the tube where increased thickness is wished short interior sections of iron or steel, which will accomplish the desired object. By this method, then, a car axle is produced for which many advantages are reasonably claimed.

The first and prominent advantage resides in the great saving in dead weight by the hollow form, which will amount to perhaps 25 per cent. or more, while the strength of the axle is in no wise deteriorated, but, on the other hand, improved, as will subsequently appear. Mr. Wheeler's axles, with their diminished weight, are claimed to stand a much higher test than the best solid ones. It is claimed to be less rigid than the solid axle, to be less liable to heat at journals, and crystallize, which is a most severe disadvantage to which the solid axle is subject. The effective combination of iron and steel in its construction gives to the tubular axle an increased tensile strength from the last named of its constituents, while the iron imparts to it the advantage derivable from its great tenacity. Again, the ability to give to the axle a steel bearing at the journal end, which can readily be accomplished by the Wheeler process, without in the least taking from the strength of the axle, by turning off the iron on the outside, as usual for the bearing, which in this case leaves a steel surface exposed, or, in fact, a steel plated journal. This axle, as is the case with the tubular iron axle, has a greater thickness of wall at this point, which extends into and through the wheel seat. This is, without doubt, a very important and advantageous feature of the invention.

A theoretical estimate of the economy of employing the hollow axle, simply in the question of saving in dead weight, has been made, which, as it has an interesting bearing on the subject in hand, we reproduce: One of the largest of American railroad corporations reports the cost of moving one ton one mile as 0·819-1000 cents. Assuming the average travel of a car at 100 miles per day, and assuming it to run upon 300 days of the year, we should have the travel per car equivalent to about 30,000 miles per year. To ascertain, now, the actual cost of motive power required to do the travel of one ton, for one year, or 30,000 miles, the following is the method: 30,000 × 819-1000 cents = $245·70. The road in question has over 50,000 cars, but suppose that 30,000 are in actual service, there are four axles of 300 pounds each to each car, or 1200 pounds of axle per car. 30,000 × 1200 = 36,000,000 lbs. or 18,000 tons of axles. Twenty five per cent. of this weight, or 4500 tons, it is claimed, is saved by the employment of the hollow axle; or, in other words, the cost of moving 4500 tons 30,000 miles at an expense of $245·70 per ton, which amounts to 4500 × 245·70 = $1,105,650.

With regard to the usefulness of the invention in other ways, it need only be added that in bridge construction the adoption of the tubular combination would prove very advantageous. In the production of merchant bar, plate and rails of combined iron and steel, the invention will in all probability find its widest usefulness. The desirability of such combination is most plainly evidenced by the very high prices which it has long commanded for many purposes in the arts. The methods previously depended upon to produce this combination consisted either in a tedious hand process, as in the case of edge tools, or in the attempts to unite large masses by the employment of fluxes, which, while in some cases adapted well enough to the work of a forge fire, are wholly unfit for and impracticable to use in the ordinary work of the rolling mills which produce rails, plate or merchant bar. It seems, however, that with large masses the difficulty of a thorough combination, without serious injury to the metals employed, has hitherto been impossible. The principle of Mr. Wheeler's invention, which has previously been alluded to, resides in the fact of bringing the two metals to a welding heat in one pile and simultaneously, and then manipulating them by rotary motion. The great difficulty in the way of effecting a combination resides in the fact that it is impossible to bring steel to the same temperature which is required to weld iron without seriously injuring its quality or "burning" it—a difficulty which fluxing only partially overcomes; while at the same time their use involves a certain amount of uncertainly in result, and a tediousness and difficulty of operation which is too great to permit of the adoption of this remedy on a large scale. Mr. Wheeler has, in his process, accomplished the result desired by protecting the steel with iron from the oxidizing and decarbonizing effects of an excessive heat, which is accomplished by simply placing the steel into an iron case, made as nearly air-tight as possible, and thus inclosed and protected it is brought to the welding heat simultaneously with the iron. By this plan, then, three other different products are obtained, to-wit: An iron-coated steel slab, plate or bar, in which case steel preponderates; steel centred iron, where iron is the principal metal used; and combination proper, in which the steel is so proportioned and placed as to endure wear and support strain.

The iron-coated steel bar, above-named, is claimed to be especially well adapted to subsequent forging, as the thin shell of iron continues to effectually protect the steel from injury by heat. If desirable the iron can be so proportioned as to leave about the steel only an imperceptibly thin coating, which can be readily planed, turned or ground off, leaving a smooth steel surface—a possibility which doubtless possesses many advantages in its application to the arts. In the rapid and economical manipulation of "scrap" steel of any kind by this process, the advantages over the old methods are claimed to be so great as to leave no room for competition. Cast steel scrap, which is now only worked by remelting, when encased in iron, as described above, can be rolled into finished bar at one operation; and even Bessemer steel scrap, which has hitherto defied every attempt to melt it up into a sound mass, is by this process reworked from any size of "pile" into any desired shape of rail, bar or plate, as sound and homogeneous as from the original ingot. The great importance of this feature of the invention to the railroad men of the country will be obvious to all those managers who have adopted steel rails, or contemplate so doing, and have felt that sooner or later they must meet the question, "What shall we do with Bessemer scrap?"

The steel centred iron is the reverse of the above, in which the iron, instead of being a mere coating, forms the larger portion of the bar. The pile, fagot or billet, from which it is reduced, is made on the same principle as that above described, namely, that of thoroughly excluding the air from the steel, which is proportioned in the pile according to the size of core desired in the finished bar. Any desired proportion of steel may be used, and any exterior form may be given to the bar as readily as to iron. This style of combination is well adapted, and has been largely applied to bolts, chain cables, car couplings, wire, etc., where great tensile strength is required. In what the inventor terms combination iron and steel bar there is piled about a central core of iron several sectional tubes of steel, each formed of half cylinders, so arranged as to break joints, as has already been mentioned in speaking of the tubular car axle. Upon the outside of these are piled sectional tubes of iron similarly arranged so as to exclude the air, the ends of the fagot being protected from the effect of the heat by a luting of fire-clay or other suitable refractory material. The bar, consisting of an internal core of iron surrounded by a concentric tube of steel, covered in its turn by a concentric shell of iron, is, after heating, all welded into a solid mass, producing a form of combination for which special advantages are claimed—*i. e.*, in addition to the perfect weld securing the tenacity of iron and the hardness of steel, the peculiar arrangement and proportions of the two metals in the form of concentric tubes around an iron core, gives largely increased strength, while the alternation of metals is claimed to be a preventive of the tendency to crystallization. The application of the invention to the production of steel-headed rails for steam and street railways is claimed to be all that can be desired, and a subsequent reference will be made to this branch of the subject. It is only necessary to add, that the American Tubular Iron and Steel Association, which represents the inventions of Mr. Wheeler, has been for the past two years engaged in manufacturing combination iron and steel, which has been largely employed for special uses. The officers of the Association are: William A. Mitchell, president; Elbridge Wheeler, vice-president; Ware B. Gray, secretary.

What is Steel?

M. A. Greiner, of the steel works at Seraing, in a paper lately presented to the Association of Mining Engineers, of Liege, attempts a definition of steel, which our readers will find interesting. He premises his discussion of the question with a general statement to the effect that the new facts discovered by practice, united with analysis, have changed the greater part of our former notions with respect to steel; but if the improvements have been brilliant, they are so recent that they are not sufficiently understood by engineers: thus many, through ignorance of the value of the new metals, preserve a penchant for old fashioned steel, even in spite of their own interests, while others, who have seen the difficulties of new modes of manufacture, imagine that the new steels are variable in composition and uncertain in their qualities; and he tells both classes that a visit to the steel works at Seraing and Sclessin will open their eyes more than all the reasoning in the world.

Steel, says M. Greiner, is, perhaps, as old as iron; at least, from time immemorial, a metal possessing peculiar properties has been obtained from rich and fusible ore, under conditions nearly identical with those of the fabrication of iron. It is known that in the Catalan furnaces steel is obtained by means of very slight modifications applied to the iron making process.

Neither the low furnace, the puddling furnace, the new rotative furnace, nor even cementation, produces metal which deserves a special title. To cite but one example, who will undertake to say at what point in the scale of puddled iron of commerce the name of puddled steel should be conferred? Yet in 1850 the last named product had its moment of celebrity, but this, with the other kinds of steel at that period, are now, beyond question, on the decline.

It is time that the terms of a good definition of steel were decided upon. In 1869 M. Greiner proposed to the same society that that title should be given to all the malleable products of siderurgy obtained in the state of fusion, reserving the name of iron for every malleable product which had not been submitted to fusion; this definition was adopted by M. Jordan, professor of metallurgy in the Central School of Paris.

It results from this definition that the old forms of steel, with the single exception of crucible cast steel, should only be regarded as iron more or less carbureted. Crucible cast steel and the steel produced by the Bessemer, Siemens, Martin and other processes, are alone real steel, and have for their characteristic the fact of their being obtained in a liquid state, and run into homogeneous and compact blocks or ingots.

Homogeneity and compactness, natural consequences of the liquid state, are thus the most important qualities of these metals, and belong only to steel. In fact, every one knows that iron blooms result simply from the juxtaposition of grains of iron in the midst of a more or less liquid scoria, at a relatively lower temperature; it is by hammering and rolling that the greater part of the scoria is forced out of this metallic sponge, and that the grains of iron are brought into sufficiently close contact to unite them more or less perfectly. This iron is produced in its primitive form for industry, one very different from that of raw steel, which, being obtained at a much higher temperature, is composed of drops of iron more or less carbureted, entirely clear of scoria, and forming, when cold, a homogeneous and compact ingot or block.

It is the high temperature called into action which gives to the new metals their character; and no other means are so effective in rendering a metallic mass homogeneous, in repelling scoria, and rendering metal compact.

In practice the differences above pointed out are the cause of the various employments of iron and steel. If a metal is required to resist hard wear, it is certainly not iron which should be chosen, for juxtaposition of grains means want of compactness, and, consequently, chances of exfoliation, separation, &c. This is especially the case with rails, and particularly with those of stations on incline plains, eccentrics, and crossings; of tires, especially those of locomotives and tenders; of slides, pivots, and parts generally submitted to friction. If a metal is required to resist shocks and prolonged vibration, steel must certainly be preferred, for the want of compactness of the iron often gives rise to small faults, which go on augmenting little by little till breakage occurs, and thus steel is preferred for axles, &c. For the same reasons steel is superior for all purposes for which welding and doubling are essential, such as the fabrication of great arbors, crank axles, &c. Finally, there are a thousand other applications for which steel is preferable to iron, notwithstanding its cost, of which we need only mention the fabrication of cannons and firearms.

Still there are plenty of uses left for iron; it will still be selected on account of its comparative cheapness for rails in many cases, in construction of bridges, for plates, rivets, wheel centers, and for all those multifarious applications to which forged iron is almost exclusively adapted. Nor must it be forgotten that the new mechanical processes of puddling have furnished iron with new arms; these processes supply blooms of large dimensions, from which a rail may be formed in one piece, a machine-arbor without any other welding than that of the particles of the iron among themselves, and which have made a step toward that homogeneity and that compactness which are the distinctive characteristics of cast steel.

M. Greiner sums up in the following effective terms: Metallurgy offers us at present two series of products, identical as to chemical composition, and only differing in the manner in which they are obtained. The former gives the scale of iron; it commences with ordinary iron in its different states, passes to fine grain iron of divers qualities, and finally to carbureted iron or puddled steel, which is often capable of being hardened; sometimes, even, it is indifferently malleable, such as the weich-floss, or Styrian steel; it is then a kind of fine cast iron, obtained in blast furnaces, with charcoal, and so highly carbureted that after passing simply through the reheating furnace, it may, though with difficulty, be hammered, and finally drawn into steel wire of first quality. At the head of this scale must be placed the cemented iron or steel, which is nothing more than iron strongly carbureted by means of immediate contact with carbon.

The second series is that of steel proper; it runs parallel with the preceding, and each of the terms of its scale find its analogue in the preceding. It commences with extra soft steel, which welds like iron and will not harden, passes through soft steel, corresponding with grained iron and puddled steel, and culminates in hard steel, corresponding with cemented iron or steel, weich-floss, or Styrian steel; this last kind of steel welds badly, and can always be hardened. M. Greiner subjoins a table showing the percentage of carbon in the corresponding terms of the two series:

Carbon.	Iron Series.	Steel Series.
0·0 to ·15 per cent.	Ordinary.	Extra soft.
·15 to ·45 per cent.	Fine grain.	Soft.
·45 to ·55 per cent.	Steel iron.	Half-soft.
·55 to 1·50 and + pr. ct.	Cemented iron or steel, Styrian steel.	Hard.

The demarcation is not in practice so decided, the table only serving to establish the parallelism of the two series, and too much importance must not be attached to the exact correlation of the terms of which it is composed.

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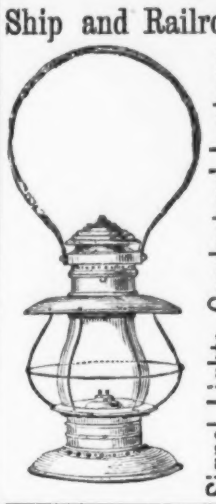

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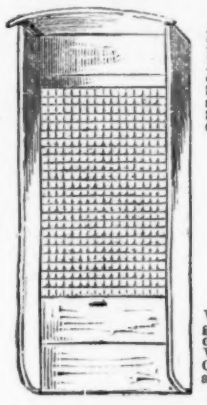

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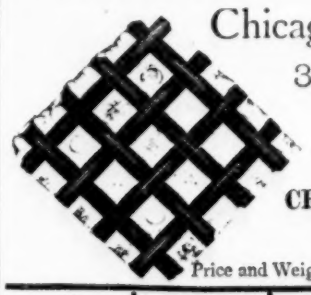

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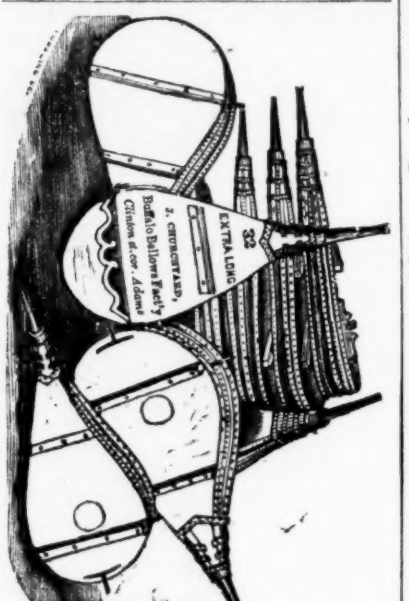

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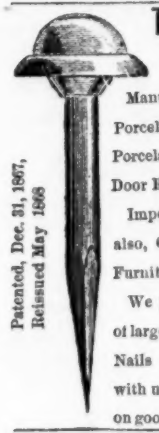

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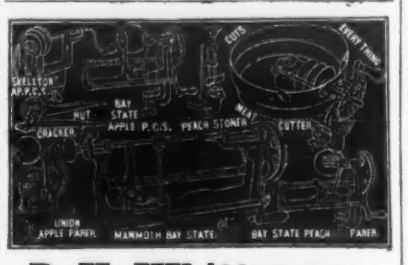

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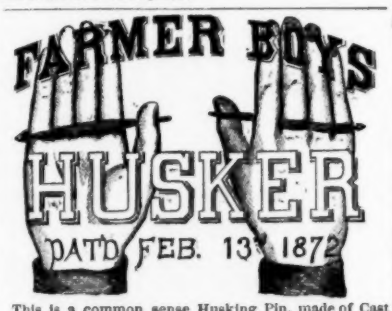

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New Patents.

We take from the records of the patent office at Washington the following specifications of certain patents lately issued, which will be found interesting:

IMPROVEMENT IN APPARATUS FOR TREATING ORES, SULPHURETS, PAINTS, &c.

Specification forming part of Letters Patent No. 139,664, dated June 10, 1873, issued to Henry H. and Charles J. Eames, of New York.

The nature of this invention consists in the construction of an apparatus that will completely eliminate the sulphur from sulphureted ores, as well as thoroughly dry white lead or any precipitated pigment, and other material, by subjecting a continuous stream of the material to be treated in thin strata upon descending alternate diaphragms with an ascending current of heated air or superheated steam, condensing the matter eliminated in any suitable manner.

Figure 1 is a vertical section of apparatus. Fig. 2 is a detail view of a part of the same.

A A are cylinders made of metal, and may be of oblong or other than circular form, provided with metal plates or diaphragms B, and flanges *d*. (See Fig. 2.) These cylinders A are firmly bolted together, one above the other, by their flanges, *d*, with a cement packing between said flanges, so as to form a vapor tight chamber, divided into a series of compartments, D, communicating with one another through openings, C, in diaphragms, B, which are placed four inches (more or less) apart, and form the partitions between compartments, D, as clearly illustrated in Fig. 1. The diaphragms, B, may be bolted on the inside of a cylinder formed of one piece, instead of the series of cylinders, A, and thus form the desired vapor tight chamber. As to diaphragms, B, or compartments, D, they may be varied in number and size to suit the nature and quantity of the material to be treated. E is the pipe to convey the vapor eliminated from the material to any suitable condenser. F, F are blades, or stirrers, made of iron. The first two or three are formed with teeth, or prongs, to break up the mass of material when it first enters the apparatus. G is the shaft running through the center of the machine from top to the bottom, provided with a collar firmly secured at bottom end of said shaft to serve as a bearing on which it revolves, and also carries the blades, or stirrers, F, F, which are firmly fastened on said shaft, and revolve the blades in each compartment, thus removing the material from one plate to the other until it reaches the bottom, or discharge pipe. H is the discharge pipe, or outlet, for the treated material, and is formed of brick, or iron, and furnished with a valve, or sliding door. *j* is the hopper wherein the material is passed into the apparatus. J is a spur wheel fitted firmly on the shaft, G, to revolve the same. K, K are openings in bottom plate to allow the products of combustion, or heated air, to pass up into the apparatus in contact with the material to be treated. In place of the openings, K, K, we sometimes use a steam coil placed in the fire under the machine, and when this is used we close openings, K, K, and admit superheated steam into the bottom of the machine, and surround the outside of the machine with the products of combustion of the fire below. This is the case when white lead or other pigments are to be treated, and direct contact of the products of combustion of the fire would prove detrimental to the pigments.

It is desirable at times to use a blower, or fan-exhaust, attached to pipe, E, and in this manner draw up through the apparatus the products of combustion of the fire below the machine, and in either case named cause a spray of finely divided water to condense the vapors generated in the apparatus, thus preventing sulphurous fumes and noxious gases from permeating the surrounding atmosphere.

L is a sliding door, or valve, at ends of outlet, or discharge pipe, H, to prevent the heated gases passing out at bottom, and is closed until sufficient quantity of the material has passed down through the apparatus, when it is partially opened to allow the material to pass out.

The operation of apparatus is as follows: A fire is started in the furnace, and when the apparatus has become sufficiently heated the shaft, G, is set in motion, and the material to be treated is fed into the hopper, I, passing down into the upper compartment, D, and from said compartment, D, falls upon the heated diaphragm, B, of that compartment, through the opening, C, in said diaphragm, into the compartment next below, and so on down from the upper compartment to the lowest, thence into discharge-pipe H, and passing out of the apparatus at valve L, the valve or door L being closed at first, and is not opened until the heated material has passed down, when it is made sufficiently wide to allow the materials to pass out as finished. A brisk fire is kept up, and the products of combustion pass through openings K K, thence up through the opening C of diaphragms B, through the series of compartments D, where the material to be treated is steadily passing down in diffused stratums, and in an opposite direction to the ascending heated air or products of combustion, completely eliminating the substances contained in the material being treated. The outlet-pipe E, when connected with an exhaust, carries off the vapor or moisture to a condenser, and also draws through the inside of the apparatus the products of combustion; and, again, when superheated steam is used, this pipe E performs the same function, and is also the case when a blower or fan is used under the fire beneath the apparatus. The said pipe E is sometimes connected to a chimney, and in this manner carries off the vapor or moisture from the apparatus arising from the material during its treatment.

Claim—1. The apparatus herein described for treating ores, animal matter, white lead, and other precipitated pigments, consisting of an outward vertical case, having within it a series of shelves and rakes or stirrers, so as to agitate the material and move it from the upper to the lower shelves.

2. The combination of the vertical case, having alternate shelves and stirrers, with the exhaust fan and condensing apparatus.

3. The combination of the furnace arranged so as to inclose the treating case, and transmit the products of combustion through it, with the draft or blast apparatus, and the condensing apparatus, substantially as specified.

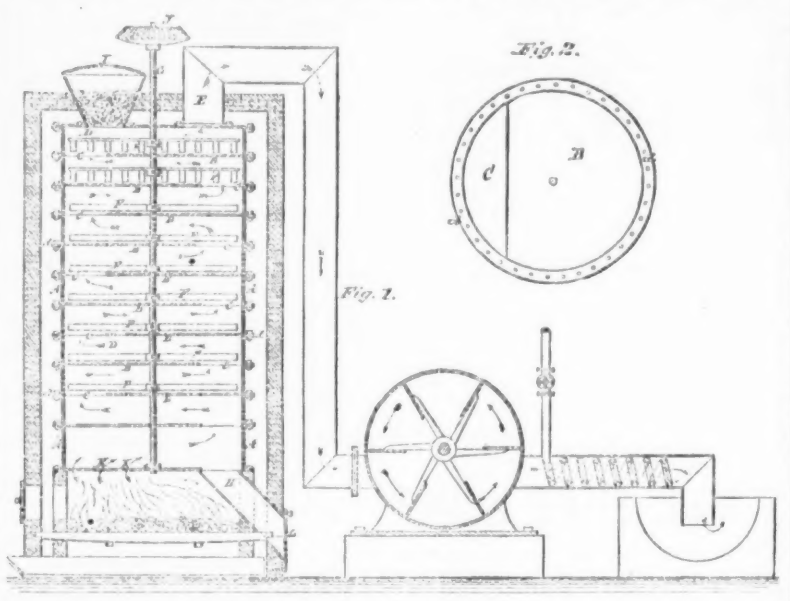

Fig. 2.

Fig. 1.

IMPROVED APPARATUS FOR TREATING ORES, &C.

IMPROVEMENT IN THE MANUFACTURE OF STEEL FOR BOILER PLATES, &C.

Specification forming part of Letters Patent No. 140,673, dated July 8, 1873, issued to Ogden Bolton, Jr., of Chartiers Township, and John Pedder, of Pittsburgh, Pennsylvania.

This invention consists in the manufacture of homogeneous boiler plate steel, of a uniformly low quality, by subjecting a hard or high steel plate or ingot to the process of decarbonization, by the use of suitable known decarbonizing agents, at less than a melting temperature.

In the manufacture of homogeneous boiler plate steel it has been found that however carefully the work is carried on all the plates will not be of uniform quality, and hence the harder plates have to be thrown out, with a consequent loss; or, if, as is commonly the case, they are worked in the danger of disaster from explosion or excessive pressure is thereby materially increased. By this process any such plates, which are found to be too hard, are readily decarbonized till they are brought to the desired standard, and then they are worked in without loss or danger. Also, it is well known that in making such boiler plates of steel on a large scale the pouring of soft steel, such as is required, is attended with considerable risk of waste and loss. If the steel be made a little harder such risk is largely obviated, but the steel is then too hard for boiler plate. By this process the inventors claim to make the boiler plate hard, and then decarbonize it to such degree that it shall be equal to the best boiler plate made, and of the same uniform quality; and such decarbonizing process we perform on the ingots themselves, or on the worked steel at any desired subsequent stage in its manufacture. The steel to be decarbonized is inclosed in a suitable box, case, retort, or furnace, and is covered on all sides, either in separate blocks or sheets, or in alternate layers, with any known suitable oxidizing agents or substances capable of evolving, when heated, oxygen, chlorine, or fluorine, or other gases, which will combine with the carbon of the steel; or such gases may be generated in a separate retort and conveyed directly to, and brought into close contact with, the steel to be decarbonized. While subjected to this process the steel is to be heated to any desired temperature, but preferably to about a cherry red heat. The process is carried on in about the manner adopted in the cementation process, and for about the same length of time, varying with the thickness of the plate, the amount of the reduction desired, the temperature employed, &c., the effect of which conditions, as effecting the result, are within the knowledge of the skilled workman, and need not be stated in detail. The utility of the process is also obvious. The plates, when brought to a uniformly low quality, are removed and worked up in the usual way.

The conditions under which the operation above described can be successfully carried on will vary considerably, as in other kindred operations, but for the general purposes we believe the following to be best: Use steel containing from ·3 to ·4 (three-tenths to four-tenths) per cent. of carbon, as this is the easiest to run, and bring the same to ingot or plate form to a thickness of about one inch. Such plates, when embedded in or surrounded by metallic or other suitable oxide, in any suitable known heating furnace—such, for example, as is used in the cementation process—is kept at about a cherry red heat for from one and a half to two days, by which they will be brought to the condition desired. With every increase of, say, ·1 (one-tenth) per cent. of carbon in the steel the decarbonizing operation should be continued about or a little more than half a day longer.

The plates produced by the process above set forth will come under the head of homogeneous boiler plate steel, though the process may be arrested before the same degree of decarbonization is carried to the center as exists at the surface. For practical purposes it will be homogeneous, and such plates are so recognized in the art.

Claim—The manufacture of homogeneous boiler plate steel by bringing a hard or high steel to a uniformly low grade, through the agency of decarbonizing agents brought to bear on the same after pouring, and while in an unmelted state, substantially in the manner set forth.

The Influence of Hardware Cargoes on Ships' Compasses.

We give the following on the authority of the *Ironmonger*. If the statements are true—and they are made with sufficient circumstantiality to challenge disproof—they are of more than ordinary importance:

Some facts of considerable interest in relation to the conveyance of hardware by sea have transpired in connection with disasters to steamers of modern occurrence. The loss of the Atlantic steamship, one of the White Star line, which has so closely followed upon the fatal destruction of the City of Washington, was due in part to a portion of the cargo, consisting of steel, having been situated not far from the compasses, which caused a great deviation in those indicators. The captain is understood not to have made himself familiar with this, and on that account, and because he drove at full speed through a fog so dense that the look-out could not see three yards ahead, he has had his certificate suspended for a twelvemonth. The Liverpool and Dublin steamer, St. Columba, that has recently been lost off Holyhead, was destroyed because the scythes of some harvest men, who were passengers, which lay on the bridge, deflected the bridge compass. The captain of the St. Columba has had his certificate suspended for nine months, because, in the opinion of the court, he ought not to have trusted to the bridge compass alone. The Dublin and Glasgow steamship, The Duke of Argyle, was saved from destruction on the 24th of April by the carefulness of the captain, who kept a watch upon the deposition of arms by the soldiers who were the freightage. A box, which was ten feet from the binnacle, was influencing the needle. The box contained six swords and three scabbards. When the swords and scabbards were removed the compass vibrated to and fro five minutes, and then settled down. Some years ago the compass of a coasting steamer showed symptoms of derangement, but it being daylight and fine weather, the defalcation was detected. In seeking for the cause it was found that there was a pack within a short distance of the binnacle containing two small sewing machines and sundry parcels of needles. All this points to the serious consequences which may result from the deposition on board ship of a certain class of hardware being insufficiently watched. Hardware shippers and passengers having such goods among their luggage should take care on their own account, as well as on account of others, to do their utmost by labeling, and otherwise to assist the people who have charge of vessels in the responsible duty of guarding their compasses from preventible derangement.

A New Plan for Street Railways.—A Cincinnati inventor proposes a new system of street railways, which dispenses with the track now necessary. Instead of overcoming the resistance in drawing by a smooth iron rail for it to run on, the draught is overcome by the size of the wheels. And the size of the wheels is the whole principle involved in this new departure; but many other matters necessary to the comfort of the passengers had to be adapted to this great diameter of the wheels. For the past three months Mr. Murch has been busily engaged in constructing a model car, and on Saturday evening this model was given a trial on Bank and the neighboring streets. In appearance the car, as a whole, is like unto nothing that we have ever seen. The body of the car is similar to that of the ordinary street car. It has but one platform, with steps at either side, and is no higher than other cars The front wheels, six feet in diameter, with a platform for the driver, are independent of the rest of the car, so far as can be while coupled to it, and turn just as the front wheels of a common carriage. The weight of the car, with its load, rests chiefly on the hind wheels, which tower up nine feet in diameter. The axles drop in such a way that the load is far below the center of the wheels, and all danger of upsetting is avoided. The wheels are of iron and similar to the wheels of our fire engines, with long brass hubs and two rows of spokes. The track of the front wheels is the same width as that of a common buggy, while that of the hind wheels is much more than the width of the car itself.

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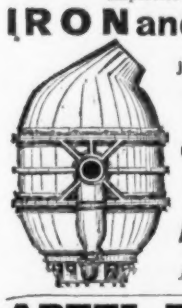
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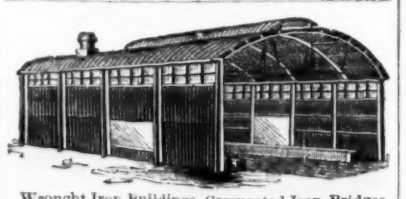
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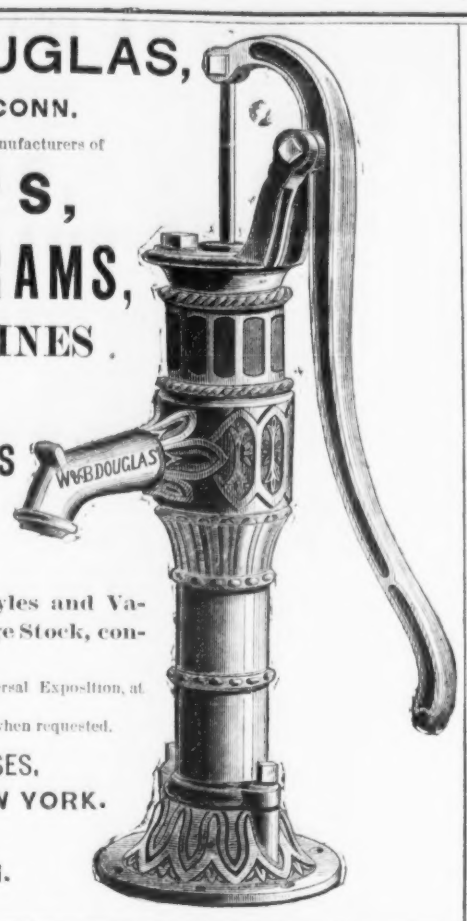

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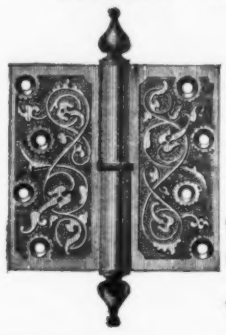

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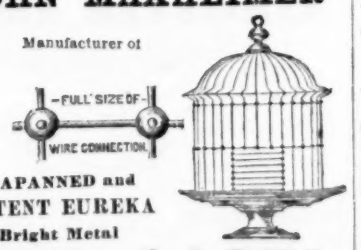

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See Price List.

Messrs. WM. F. SHATTUCK, & CO., 115 Chambers Street, Agents, &c.

Manufactory, 606 E. 11th St., New York.

Krupp's Cast Steel Works at Essen.

On the eastern bank of the Rhine, at the point where that river receives the waters of its tributary, the Ruhr, stands the noisy and smoke begrimed town of Essen, now world renowned from the extent and importance of its metal industries. It contains about 30,000 inhabitants, of which three-fifths obtain their being directly from Krupp's Works, another fifth indirectly from the same source, while the remaining portion derive their subsistence from a wire mill and a few other establishments of less importance.

Less than a century ago Essen was one of the most quiet hamlets on the Rhine; it contained a nunnery and a few houses, including a blacksmith shop. In the beginning of this century this shop came into the possession of Mr. Friederich Krupp, then an ambitious young artisan of slender means, but possessing extraordinary energy and perseverance, coupled with rare mental qualities. It was his delight, during his leisure hours, to make experiments with specimens of iron ore found in the vicinity, and, after a few years, he built a small Catalan forge, and succeeded in making wrought iron from the ore. In the meantime was born his son, Alfred Krupp, who, we have been told, first saw the light in 1812. At an early age he had to pull the bellows and help his father, who took great delight in instructing his son in the mysteries of his trade, and making him his assistant in all his experiments. By degrees the establishment was enlarged, and everything promised a bright future, when suddenly Mr. Friederich Krupp died, in 1827. The business was, fortunately, intrusted to the charge of a workman and young Alfred Krupp, who worked like an ordinary workman until years after he had taken full possession of the works. His workshop was both his study and his laboratory. The old workmen still show, near one of the largest hammers, the place where he used to sleep while they reheated the iron for forging. The profits of the concern were for many years spent in improvements and enlargements, and the young master had not unfrequently difficulties in raising money enough for pay day, yet he never failed to pay his men promptly. The first power hammers used in the forge were driven by water, but steam-power was soon substituted and the hammers enlarged. As this improvement was one of the most important steps in all Mr. Krupp's career, we will here describe his first steam hammer. The handles were the trunks of trees, circled by bands of iron, sustained by pillars, and mortised in the heads of hammers which weighed about 2000 pounds, and which a steam piston alternately raised and let fall. This was the first rudiment of the hammer with the perpendicular stroke, which, at a later period, gave to the iron trade many other facilities in the use of power. Imperfect as it was, the invention set Mr. Krupp upon the true way of success. In all improvements which he introduced, and which gradually were necessitated by the rapidly increasing orders, he for many years exercised a personal supervision, and was always the first at the post of action and responsibility.

With the death of Friederich Krupp the works came into possession of his son Alfred. Although he is really the architect of his great establishment—since it was but a small factory his father left him—he has always retained his father's name as the firm name of the concern. "My father was the founder—I have simply built on the foundation he laid; a good beginning is the main thing," says Mr. Alfred Krupp, modestly, and not incorrectly, for without a good foundation he might not have achieved his great results. But let a bottom be ever so sound, a strong and solid superstructure can never be built successfully without careful attention to the minutest details. Accuracy in everything has been, and is, the great secret of Mr. Krupp's success. Outsiders are not permitted to enter the gates of his establishment, but it is well known that every department is conducted with the most scrupulous care, fidelity and discipline. His laborers and mechanics are trained methodically; his overseers are practical mechanics, and graduates from the polytechnic schools of Germany. At his laboratory are several chemists, one of whom is one of the most celebrated analytical chemists on the Continent. Mr. Krupp also retains a doctor of laws, who is constantly engaged with the settlement of contracts and disputed questions of law. There are several interpreters in different languages to converse with the many foreigners who call at the office.

We are indebted to Messrs. Thos. Prosser & Son, Herr Krupp's American agents, for the following details of the capacity, plant and production of the works at Essen:

This cast steel manufactory, near Essen, was established in the year 1810. It was conducted by Mr. Alfred Krupp from the year 1826, and in 1848 he became sole proprietor. The works have been gradually developed, until—January, 1873—they cover a continuous area of about 1000 acres, of which about 200 acres are under roof, employing more than 12,000 workmen, independent of about 2000 who are supplied by building contractors. In the mines and smelting works belonging to the firm there are employed a further number of about 5000 workmen, the total number employed amounting to about 17,000 men, beside 739 officers and regular employes.

The quantity of cast steel produced in the year 1872 exceeded 125,000 tons, consisting of axles, tires, wheels, and crossings for railways, rails and springs for railways and mines, shafts for steamers, different pieces of machinery, boiler plates, rolls, spring steel, tool steel, guns, gun carriages, shot, etc., etc.

There are now in operation 250 smelting furnaces, 390 annealing furnaces, 161 heating furnaces, 115 welding and puddling furnaces, 14 cupola and reverberatory furnaces, 160 furnaces of other kinds, 275 coke ovens, 264 smiths' forges, 240 steam boilers (beside 70 more now in course of construction), 71 steam hammers, viz:

Nos.	2	1	2	1	5	3	1	7	8	18	2	1
(Each) Cwt.	2	3	4	7	8	10	12	15	20	30	60	65
Nos.	6	2	3		4		1	1		1	1	1
(Each) Cwt.	70	75	100		110		140	150		300	400	1000

286 steam engines, viz:

Nos.	3	57	46	16	17	6	1	4	38	4	21	16	3
(Each) H. P.	2	4	6	8	10	12	13	14	16	18	20	23	25
Nos.	22	5	2	4	4	2	3	1	5	1	1	3	1
(Each) H. P.	30	35	40	45	60	80	100	120	150	200	500	800	1000

representing altogether nearly 10,000 horse power. 1056 machine tools, viz: 363 turning lathes, 82 shaping machines, 195 boring machines, 107 planing machines, 42 punching and grooving machines, 32 pressing machines, 63 grinding machines, 31 glazing and polishing machines, 142 machines of different kinds.

In 1872 there was consumed: Coal, 500,000 tons; coke, 125,000 tons; water, 113 million cubic feet, supplied from several water works; gas, 155 million cubic feet, supplied by the gas works of the establishment, for 16,500 burners.

The works have connection, by rail, with the Cologne-Minden, Bergisch-Markisch, and Rhenish lines.

To facilitate the traffic at the works, there are about 24 miles of track of usual gauge, with 180 sidings and 39 turn-tables, on which run 12 tank locomotives (diameter of cylinder, 16 inches), and 530 cars; six more locomotives are now in course of construction. Also about ten miles of narrow gauge track (30 inches), with 147 sidings and 65 turn-tables, on which run 3 locomotives (diameter of cylinder, 6 inches), and 270 cars; four other locomotives are now being constructed. Horses are also used on the narrow gauge road.

The carting department comprises 191 horses and 272 carts.

To facilitate the communication between the several workshops there are 30 telegraph stations. There are 166 watchmen, and a permanent fire brigade of 70 men, who also perform police duty.

The general supply stores, under control of the firm, supply to voluntary purchasers (belonging to the works), for cash, provisions, clothing, dry goods, boots, etc., at cost prices. The present receipts amount to about $55,000, gold, monthly, and are continually increasing. In this department there are 1 hotel, 3 beer houses, 1 seltzer water manufactory, 1 flour mill, and 1 bakery with 2 steam engines, producing, at an average, 85 tons of bread monthly.

Of the dwellings for the officers and workmen, there are of the former 266, of the latter 2948, either inhabited or in course of construction. At the present time there are living in these houses, the number of which is being rapidly increased, already more than 8000 individuals. The existing boarding houses offer board and lodging to 2500 unmarried workmen, and other houses of the same description are now being built, with accommodation for 1600 more. The arrangements for the accommodation of the sick consist of 1 hospital, containing 100 beds, and 1 epidemic hospital, with 120 beds, all under the supervision of physicians especially engaged for the purpose.

A sick, burial and pension fund has also been instituted for all workmen who receive wages from the firm; the latter contributes to this fund half the amount of the contributions paid in by the members, also providing pensions and support for those who have been rendered unfit for work in their service, and for the widows of their workmen. The total receipts for the year 1872 amounted to $80,000, gold, the expenditures to $62,500, gold, and the fund in hand at the beginning of the present year (1873) was $96,740, gold. From another fund members receive for their families free medical treatment, on paying 75 cents annually.

The firm has also organized a chemical laboratory, a photographic and lithographic atelier, and a printing and bookbinding establishment. In the printing office there are two steam and four hand presses in operation.

Beside the Cast Steel Works near Essen, the firm Fried. Krupp possesses considerable mining and smelting works, which render the same independent of fluctuations in prices, and enable it to secure a regular and uniform supply of the best raw material. This department comprises:

1.—Administration of Krupp's Mines.

(a) Coal Pits:
1. Pit, "Graf Beust."
2. " "Ernestine."
3. " "Friedrich Ernestine."
4. " "Hannover."

Also, one-third in the concessions "Humbolt" and "Diergardt," on the left bank of the Rhine.

(b) Iron Ore Mines:
1. In the mining districts, Kirchen, Daaden, Siegburg, Hamm, Neuwied, representing 64 mines. (Nos. 1 to 64).
2. In the mining districts, Wetzlar, Weilburg, Dietz, Oberhessen, Rheinhessen, and Dillenburg, representing 294 mines. (Nos. 65 to 358).
3. In the mining districts, Hamm a. d. Sieg, Wied, Unkel, Coblenz, Runderoth, representing 56 mines. (Nos. 359 to 414).

Total number of mines 414, with an area of about 50,000 acres.

The firm Fried Krupp possesses important concessions of excellent iron ore beds in North Spain, whence it is intended to import annually up to 300,000 tons of ore for the production of cast steel. To facilitate the importation, a railway in Spain nearly eight miles long, as well as several steamers, are now in course of construction.

2. The administration of Krupp's Smelting Works comprises:

(a) The Sayner and Oberhammer Smelting Works, containing two blast furnaces, one of them fed with charcoal; both of them produce daily about 20 tons of spiegeleisen and charcoal spiegeleisen. An iron foundry and a machine manufactory are connected with the Sayner Works.

(b) The Mulhofer Smelting Works, on the Rhine, connecting by a branch line with the Rhenish Railway, terminating at the Engers Station, and containing four blast furnaces (3 of them of the latest Scotch construction), with pneumatic lifts. Each of them produces daily about 45 tons of spiegel, Bessemer and fine iron.

(c) The Hermanns Smelting Works, on the Rhine, near Neuwied, also connected by a branch with the Rhenish Railway, has at present only one blast furnace in operation; two others are, however, in course of construction.

(d) The Bendorf Smelting Works, with one blast furnace of an older pattern, are, at present, not in operation.

(e) The Johannes Smelting Works, formerly the property of the German-Dutch Joint Stock Company, for smelting and mining, near Duisburg, on the Rhine, produce daily, in four blast furnaces, from about 140 to 160 tons. The construction of six more furnaces has commenced, and the works are in connection with "Rhenish and the Bergisch-Markisch Railway."

These works have also 140 coke ovens in operation, and 120 in course of construction. The production of Krupp's Smelting Works, with 11 blast furnaces, is, at the present time, nearly 10,000 tons pig iron per month.

From the smallest tool to the largest engine, everything is a model of its kind, mostly manufactured on the spot of the best material and from the most careful design. The crucibles for resmelting the puddled steel are also made on the premises of fire clay, with an admixture of plumbago. Each has a capacity of about 75 pounds, and as many as 100,000 of them may be seen at any time drying in the sheds. When once used they are broken up and go to make others. In the casting house where the large ingots are run, the furnaces, which contain 1600 crucibles, range along each side of the building, while in the center the molds, varying from 100 pounds to 40 tons, have adjusted over them two pairs of rails, upon which run a movable crane. In the casting of such a large ingot as one of 40 tons, which was shown at the Paris Exposition of 1867, from crucibles of small quantity, the perfection of the organization in Essen is strikingly shown. The operation is carried on with military precision, generally by signals. The place for the molds is selected and the canals are placed. At the first signal the furnaces are uncovered and the coal is taken out. At another signal two men at each furnace seize a crucible with tongs, hook it to a bar, by which it is lifted out and set down in front of the furnace, another pair of workmen seize it and carry it horizontally to the troughs. The workmen arrive in such rapid and precise succession that as they pour the molten steel into the troughs it constitutes a continuous stream. The troughs end in the basin of reception. This work requires much nerve and a high degree of discipline in the execution of manœuvres. Out of 100 picked men promoted to it, 40 give it up as too much for them. Castings are always made in the morning. The ingots are not allowed to cool, but are stored in stalls and covered with fine coal. Some times a $1,000,000 worth of steel in ingots are thus stored.

With such a scientific accuracy is the operation performed, that the ingot, when broken up and examined by a microscope, does not exhibit the slightest flaw. The forging of such a large ingot requires large steam hammers, but we have above stated that the largest hammer in the establishment weighs about 100 tons, and by it a still larger ingot might be forged. This hammer, including its foundations which are 100 feet deep, cost over one million of dollars.

Mr. Alfred Krupp is now sixty years of age. He is known as Baron Von Krupp, the German Emperor having conferred on him the title of Baron, a degree of nobility next to that of Count in Germany. His achievements as a manufacturer surpass all others of our time, and of former times, in the extent of his works, the magnitude of his operations, and in the uniform excellency of his manufactures.

New Iron Ore Discovered in California.—The Santa Cruz (Cal.) *Sentinel* says: On the coast cliffs north of Laguna Creek may be seen large bodies of magnetic iron ore cropping out amid shale and chalk rock, as if blistered by the hot sun. We have never seen better indications of a good iron mine than in that vicinity, especially inside the creek basin on the northern bluff. There are also beds of bog ore in the basin, as indicated by the ochre-yellow or dense red-iron rust scum which oozes up through the boggy soil. We noted several of these springs. The whole coast along, above and below Pebbly Beach, is veined with rich iron ores. At the Yellow Bank dairy the sulphurets of iron have discolored the rocks and clay—hence the name. We believe that there is iron enough in the San Vincente Ranch to build all the railroads required in the State, if worked up into rails, ties, frogs and spikes. It is certainly worth some prospector's time, who is competent to judge, to mine out some of the ore and have it assayed.

Messrs. Cramp & Sons are engaged in building six iron steam colliers for the Reading Railroad Company, each 1500 tons burden. The keels of four of these vessels have been laid, and it is expected the contract will be fulfilled in less than six months' time. In about three weeks they will launch a fine iron steamer of 1400 tons burden, for Mr. Wm. Clyde, of Philadelphia, the vessel being destined for the trade between New York and Havana.

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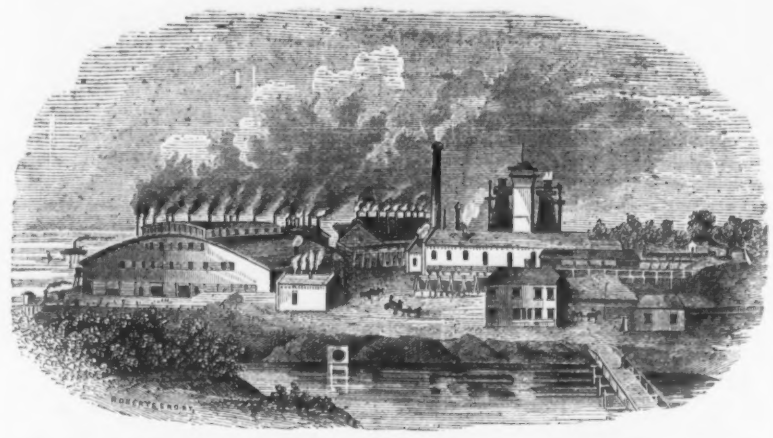

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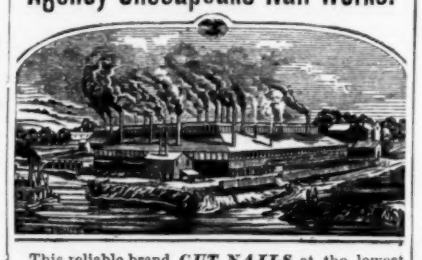

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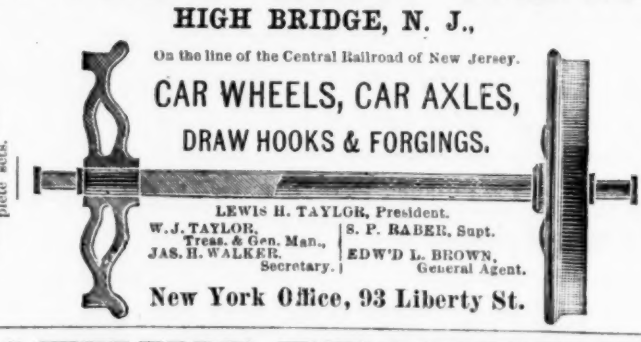

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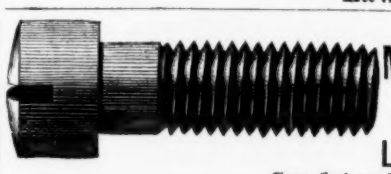

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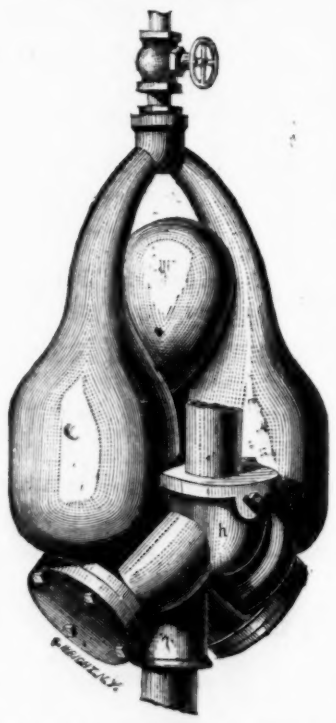

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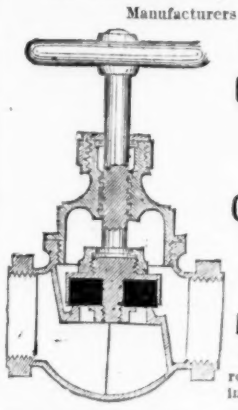

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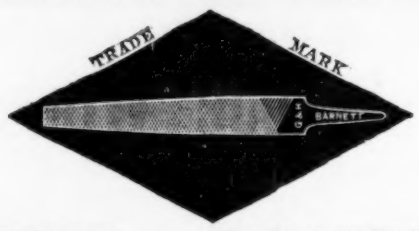

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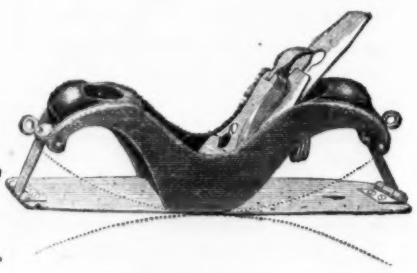

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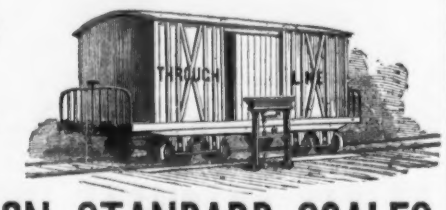

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Adopted at 13 different Furnaces.

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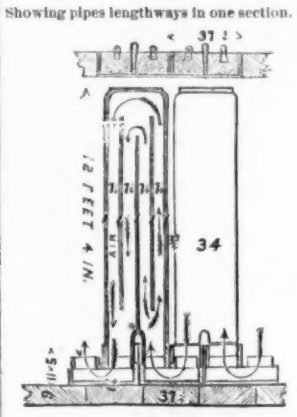
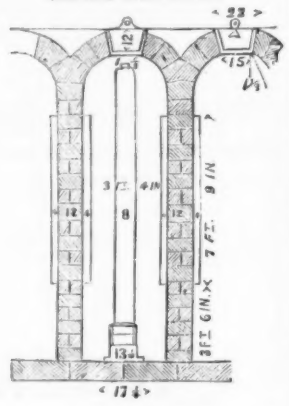
Showing pipes lengthways in one section.



End view of one section.



REFERENCE.

PHILADELPHIA, Nov. 16, 1872.

PAULDING, KEMBLE & CO.:

GENTLEMEN: We have five sections of the "Ford's" Ovens in use since blowing in our new Furnace on the 21st of October. The Ovens have given entire satisfaction; we consider them superior to any Cast Iron Oven in use; they heat the air to a greater degree with much less gas and heat on the brickwork than the Player Ovens; they cost less for construction, and, we believe, will prove more durable, and less expensive to keep in repair. Our main difficulty thus far has been to keep the heat down to 1000 deg.; our average is from 1100 to 1200 deg.

In all cases the Cast Iron Key Boxes to form the arch should be filled in lightly with fire-brick blocks, laid dry and covered with loam, or, *better*, a cast iron plate, to cover the top, with a ring in it, so as to be easily removed.

We built our ovens in one block, entirely of *fire brick;* the cost of the brick work entire was about 5000 dollars, say about 1000 for each oven.

We put 4 courses of fire-brick in the bottom, laid on a loose slate rock, laid dry, and well grouted each course with Kaolin grout.

We can recommend the Ford Ovens with great confidence to iron men who wish to construct the best kind of ovens in use in the United States. Yours, truly, J. B. MOORHEAD & CO.

P. S.—Our Furnace is now on her 3d week, making about 28 tons per day good Foundry Iron—15 feet bosh, 50 feet high.

NEW YORK SCREW BOLT WORKS.

(Estate of R. J. DEWHURST, deceased.)

JOHN COCHRANE, Executive Agent and Manager,

Office and Works, cor. Ave. D and 11th St., N. Y.

Bolts, Nuts, Turnbuckles, Washers, Forgings, &c

The attention of large consumers solicited.

Something New for

OTIS FURNACES & MINES.

New Union Steam Safety Elevator,

How One Works.

RIVERSIDE IRON WORKS, DEWEY, VANCE & CO., Wheeling, W. Va., January 14th, 1873.

Messrs. OTIS BROTHERS & Co., New York.

Dear Sirs: The experience of a year proves that ***your Furnace Elevator is superior to all others in use.*** We have in the six weeks from December 1st to Sunday last, 12th inst., made ***2724 tons, 1401 lbs. Pig Metal,*** or an average of near ***65 tons per day,*** which required the elevator to ***lift 72 feet high*** 4½ tons Ore, Coke and Limestone for each ton of metal produced, or ***more than 11,500 tons material in the 6 weeks.*** The largest yield in ***one*** day was ***81 1-4 tons*** Iron, involving the lifting of ***345 tons*** material ***in 24 hours.*** This has all been done to ***our satisfaction,*** and that, too, in the ***coldest weather we have had.*** Other furnaces with ***water*** and ***pneumatic hoists*** have experienced ***great difficulty,*** on account of the ***water freezing*** in the ***tanks;*** and in the case of the ***air*** hoists, we understand that two furnaces, not far from us, ***had*** to ***"blow out,"*** from being ***unable to hoist stock*** during the ***"cold snap."*** The difficulty, we are told, was caused by the ***condensed moisture*** in the ***blast freezing to the sides of the cylinders,*** so that the ***piston could not move*** up or down.

Very truly, yours, DEWEY, VANCE & Co.

Send for Circular to

OTIS BROTHERS & CO.,

348 Broadway, NEW YORK.

BUSINESS ITEMS.

NEW YORK.

The preliminary work on the Poughkeepsie Bridge will commence immediately. The builders will be the Keystone Bridge Company, who have subscribed largely to the stock. The machinery and tools used on the St. Louis Bridge will be transported there. The machinery for boring in the bottom of the river, used for the Brooklyn Bridge, will be used, and will be put to work when the river location of the piers is determined. The land piers will then be determined and the mason work commenced. It will be by far the longest, highest, and most magnificent bridge in the world. Five spans of 500 feet each have never before been attempted, but Mr. Linville says "It is all simple enough; it is only a matter of calculation and money." The length of the spans will require the ironwork of the bridge proper to be 60 feet high. This will make the total hight, and where the railroad track will run, 194 feet above the water.

Some weeks ago ground was broken for the necessary buildings of a new and important establishment at Elmira, that of the La France Manufacturing Company. The works, for which an eligible site has been purchased convenient to the railroads, will be of an extensive character. The machine shop will be 200x40 feet; the brass foundry, 25x20 feet; the blacksmith shop, 26x30 feet; the boiler shop, 25x30 feet; the molding room, 40x40 feet. The establishment will manufacture La France's steam fire engines and rotary pumps. The buildings will be constructed entirely of brick and iron. Power will be furnished by a first-class 90 horse-power stationary engine, now building at the Union Iron Works. The establishment will employ an average force of 150 hands.

Work on the American Paper Car Wheel Manufacturing Company's new building, at Hudson, has begun. It will be 150 feet in length by 37 or perhaps 40 feet wide, exclusive of engine room and a blast furnace to be erected at a future time. The whole is to be built of brick, in the most substantial manner, with slate roof throughout. The company has already orders on hand sufficient to start the manufactory.

Delamater Iron Works have 730 men at work, and is constructing the machinery for a new steamer building at Weehawken, by Sneeden, for the Fall River Iron Works Co., to replace the Bradford Durfee on the route between Fall River and Newport. The engine will have a 50-inch cylinder and 12 feet stroke of piston. They have just finished extensive repairs to the George Cromwell, and have the George Washington in hand. Engine No. "203," for a new steamer building at Mystic, for the Galveston trade, is being set up in the shop. The works are largely engaged in building air compressors, caloric and other stationary engines.

PENNSYLVANIA.

An extension has been added to the works of Ferris & Miles, at Philadelphia, of 140x60 feet, for manufacturing machine tools. They have also added a 20 ton power crane, and new tools, including a 6 foot square planer to plane 16 feet long. Beside these, there is a new boiler house and machine shop, with a wing 70x20 feet, filled with smaller tools.

Messrs. Wm Clark & Co., Pittsburgh, are about to put up a new addition to their rolling mill, for which they are having a large engine built by McIntosh, Hemphill & Co. They will remove their present muck train into the new mill, beside which they will put in a new 12 inch train. Their business is rapidly increasing—hence, they find it necessary to enlarge their facilities. They will be represented at the forthcoming Industrial Exposition at Cincinnati by some handsome specimens.

The contract for furnishing cast iron water pipe for the Sewickly water works has been let to the well known firm of Jesse W. Starr & Son (Camden Iron Works), 403 Walnut street, Philadelphia.

A new hot blast and an engine with five boilers are being put in at Fairchance Furnace, Fayette county. This is a charcoal furnace, and an old one, having been built in 1749.

MARYLAND.

Malster & Dennell, Caroline Iron Works, Baltimore, are repairing the revenue steamer E. A. Stevens, finishing up the engine and boilers of the new steamer Raleigh, and are full of work repairing.

The Reeder Iron Works, Baltimore, are overhauling and repairing the steamer Keyport, belonging to the Washington and Acquia Creek route, on the Potomac; also, the steamer Ellie Knight, of the Richmond route.

The People's Iron Works, Baltimore (Clark & Co.), have just finished two boilers for the British steamer Suffolk, and are overhauling and repairing her.

MASSACHUSETTS.

The manufacture of the arms ordered by the War Department has commenced at the armory at Springfield. The order consists of 10,000 metal scabbards, 8000 carbines for cavalry, 18,000 muskets for infantry. These are all to be manufactured on the models adopted by the recommendation of the board on small arms.

The Ames Works, at Chicopee, have shipped a set of machinery, consisting of lathes, planers, etc., recently turned out of the works for the machine shop of the new cotton mills with which Gen. Nye, of the above place, is connected.

A new iron bridge is being built at Stockbridge, over the Housatonic River to Glendale. It is to be built on the Herthel plan, 1000 feet between abutments. The builders are Hawkins & Burrell, of Springfield.

The Upham Machine Company's main building is nearly completed, and the foundry building will be immediately commenced. The company expect to start business about Sept. 1.

The works of the Albion Lead Company, at Dighton, are to be extensively enlarged by an addition of 100x50 feet in size.

CONNECTICUT.

Fitch & Brainerd, of New London, are building for parties in Central America a steamboat 30 feet long and 8 feet beam, to engage in the cocoanut and fruit business there.

The Meriden Britannia Company, of Meriden, are making extensive additions to their factory. Two stories are to be added to the machine and other rooms on the west side next to the railroad. The rooms will be 130 feet in length, with a width of 40 feet, which, when completed, will give the company considerable more room, although not enough to supply their actual wants.

RHODE ISLAND.

As soon as some new machines that are now nearly completed are started up, the Nicholson File Company, of Providence, will be able to turn out fully 600 dozen files per day. These files, as now cut, are said to be equal to the best hand cut files.

The Providence Tool Company has just begun to fill the order for 500,000 stand of arms for the Turkish government.

OHIO.

The Monitor Furnace Company, Ironton, a few days ago shipped 20 tons of car wheel iron to Hannibal, Mo., the first instalment of an order from that locality. This company have their entire blast sold ahead.

The Ohio City Iron and Nail Works, at Martin's Ferry, are in course of rapid construction. The works are being built by a joint stock company. The capital stock authorized is $150,000, divided into $100 shares. Wm. Clark is president, Wm. Barnett, late of Staffordshire iron district, England, is superintendent, and C. A. Burrows is secretary. Coal, iron ore, limestone, and fire-clay abound in the immediate vicinity. The company has secured 100 acres of this coal, 5½ feet vein. The cost of this and the lower strata, ore, limestone, sandstone, and all other minerals, was $20,000, payable in stock of the company. These special terms, as also a donation of 15 acres of land, were obtained from Mr. Wm. Clark, as an inducement to locate the works on this property. This coal can be delivered at the works at about four cents a bushel. Transportation facilities are excellent, by rail or Ohio River.

Lambert & Gordon, Ironton, are pushing a large force of hands toward the completion of the engines, hot-blasts, &c., for the Iron and Steel Co. During July 176 tons of finished castings were turned out from this shop—a greater amount of work than ever before produced in the same time from this establishment.

The Allianee Rolling Mill, Alliance, is an extensive establishment. The number of hands employed, exclusive of miners, is 440, and the average product for the first six months of 1873 was 101 tons per day. The amount of old rails and pig iron worked up the past year was 27,000 tons, and the amount of coal burned 39,000 tons. For the six months ending July 1 there was paid for labor $147,000.

The Zanesville *Courier* says: It gives us great pleasure to inform our readers that the coke produced in Schantl's patent coke ovens, from coal mined in this vicinity, has just now undergone a most carefully managed (and for ten days continued) trial in the blast furnace of the Ohio Iron Company, and shown itself to be an article of great excellence, surpassing all expectations. This is a fact of great importance for our iron industry, and the establishment of the Zanesville Coke Company is to be considered a brilliant success.

ILLINOIS.

The Chicago Lantern Manufacturing Company, with a capital stock of $150,000, has just been organized.

A new factory for the manufacture of vises, wrenches, punches and other small railway supplies, is to to be immediately erected at Chicago.

KANSAS.

We have it from reliable authority that the machine shops of the Missouri, Kansas and Texas Railroad, now located in Junction City, are to be immediately removed to Denison. The shops were originally built by the Kansas Pacific Railroad, Junction City giving $150,000 to have them located there. Afterward the Missouri, Kansas and Texas Railroad purchased them of the Kansas Pacific, and added much to them.—*Denison Journal.*

The new machine shops of the Missouri, Kansas and Texas Railroad, at Parsons, will be soon completed and in operation. The work will give employment to about 100 hands. Additional shops will be constructed this season.

Annealing.—The change produced by annealing is not well understood. Most of the malleable metals assume two distinct forms: one crystalline, which is the result of slow cooling, and the other fibrous, which is brought about by hammering or rolling. If hammered or rolled beyond a certain point, the metals become so hard that they cannot be bent without breaking. If annealed beyond a certain point, the metals become crystalline. Thus, zinc may be drawn into a very flexible and tenacious wire; but if kept in boiling water too long it resumes its original brittleness, and displays a crystalline appearance when broken. The particles of the metal change their arrangement without altering the external form, and this change may be brought about in various ways; thus, brass wire looses its tenacity by exposure to the fumes of an acid, and even by air acting on its surface in a damp atmosphere. Hence it is necessary to preserve wire, such as is used in the manufacture of pins, in a dry air, or under the surface of water.

One of the most important discoveries in economic geology made during the past year is that of tin in Australia. Tin has been met with heretofore in Australia, but the recent discoveries indicate far richer deposits than any before known there. The district in which the metal is found is along the valley of the Macintyre River, on the high plateau of the Australian Alps. The ore occurs, as usual, in granite, and so disseminated as to form a kind of stockwork. The overlying surface deposits contain large quantities of oxide of tin, and it is probable that a very large amount of ore will be obtained from the diggings or washings. In a series of trials recently made 20 pounds of detritus were found to yield from three ounces to two pounds of ore. The tin bearing belt is known to have more than 150 miles of linear extent so that these new mines may, in time, become quite as productive as those of Banca or Cornwall.

HENRY DISSTON & SONS'

SAW, TOOL,

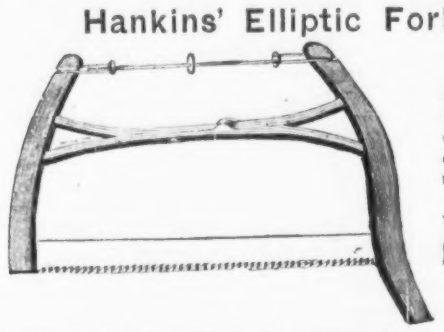
STEEL AND FILE WORKS,

Front and Laurel Streets,

PHILADELPHIA, PA.

Hankins' Elliptic Forked Saw Frame.

Patented June 28th, 1870.



The annexed engraving represents HANKINS' ELLIPTIC FORKED SAW FRAME, which commends itself to the trade for its simplicity of construction. The Forked Brace being all in one piece, without any centre bolt, secures for the Frame great strength and durability.

These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

HARVEY W. PEACE

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AMERICAN SAW CO.,

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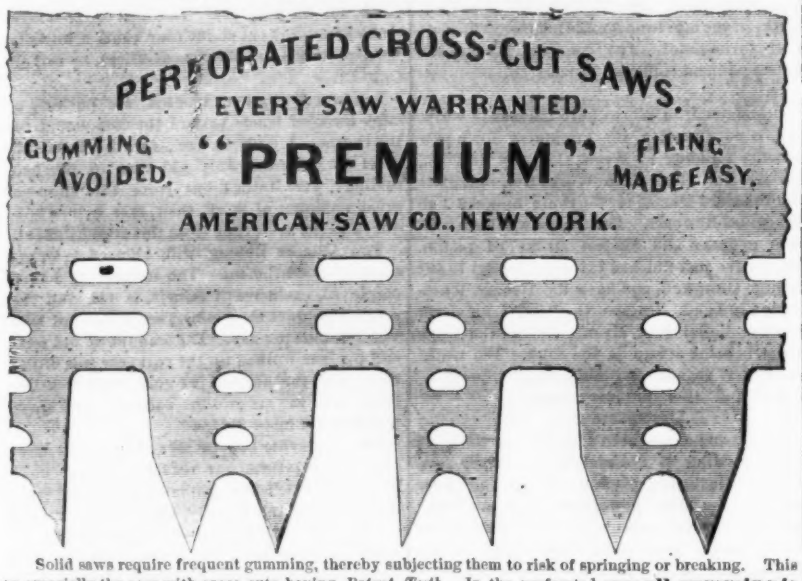

Solid saws require frequent gumming, thereby subjecting them to risk of springing or breaking. This is especially the case with cross cuts having *Patent Teeth*. In the perforated saws **all gumming is avoided,** and the teeth are easily kept long and in *proper shape*, saving *files, labor, expense* and *vexation* As is well known, our saws cut faster, smoother and easier than any other.

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SAWS OF ALL KINDS.

FACTORY, WILLIAMSBURGH, N. Y.

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ENGINEER

and General Machine Maker,

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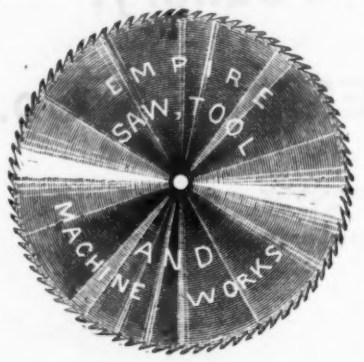

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Of the most approved make, on hand and for sale; warranted to grind either straight or to any given taper or bevel. Sole maker of the

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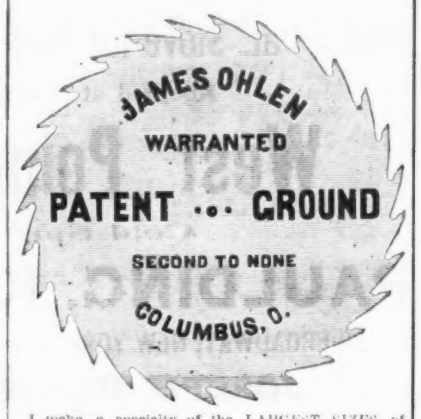
General Machine Work executed to order.



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Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.

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I am sole proprietor and manufacturer of the celebrated **"Challenge" Cross-Cut Saw.** Price Lists of all kinds of saws sent on application.

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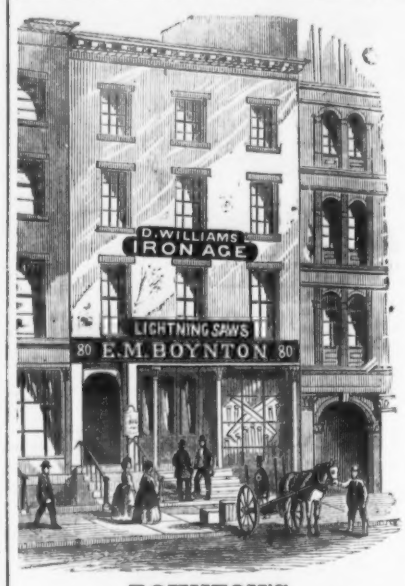

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Two Direct Cutting Edges, instead of one Scraping Point. Note extra steel and durability over the old V, outlined on M tooth.

A Challenge of $500, toward expense of a public test, to prove that the Lightning Saws excel all others in Speed, Ease, and Simplicity, has been offered since 1870, and has never been accepted. More than 100,000 Lightning Saws were sold during the year 1872, the purchasers of which testify to their superior merits.

Our leading papers, such as the *Tribune, American Agriculturist, Christian Union*, etc., have published over sixty editorial notices recommending these Saws. Farmer's Clubs, Lumbermen, and Hardware Dealers unite in pronouncing the genuine Lightning Saw the greatest labor-saving implement of the age.

I have hundreds of letters from practical sawyers, voluntarily written, expressing their entire approval of these Saws.

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Manufacturers of Warranted Cast Steel

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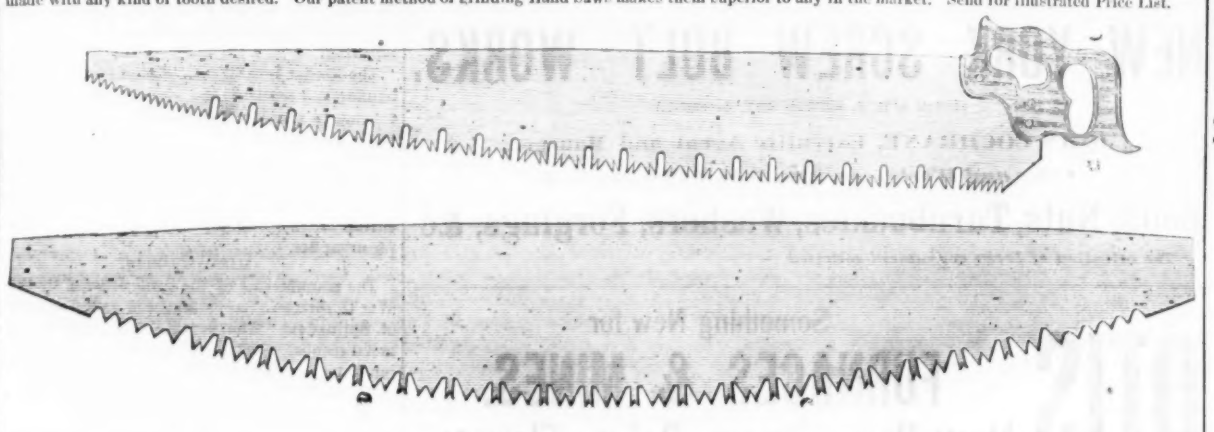

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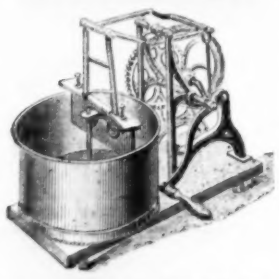

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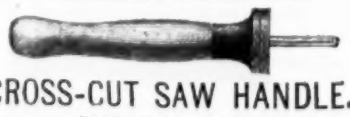

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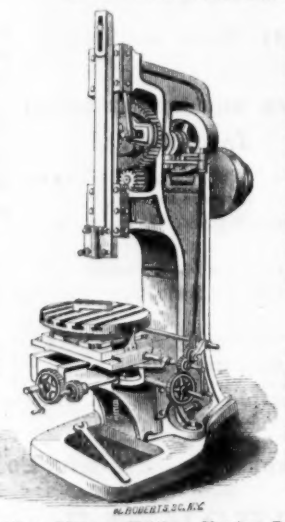

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We warrant our Knives equal in cutting qualities and workmanship to any made. We also make
SILVER PLATED POCKET KNIVES,
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Blast Furnace Construction.

The blast furnaces employed in smelting iron ores in Great Britain, beyond having been, from time to time, enlarged in size or internal capacity, remained without any great alteration in their external shape, or other improvement in construction, from the last centuary up to about the middle of the present one, being, during that period, little more than great pyramids of massive masonry surrounding a central cavity in which the smelting of the iron ores took place; many examples of these are still to be seen in various parts of Scotland, Wales, and Staffordshire. The commencement of the iron manufacture in the Cleveland district, however, inaugurated quite a revolution in this respect, as well as in many other time honored details of our blast furnace practice; and furnaces were built which were but thin stacks or mere shells of brickwork, encased in an outer coating of plate iron, and under which the massive columns, or rather solid blocks, of brickwork or masonry, which formerly supported the body of the furnace, were replaced by cast iron columns, which modification not only immensely reduced the quantity of materials required for the construction of the furnace itself, but also allowed of easy access to the region of the tuyeres and hearth of the furnace. On the Continent, however, the ironmasters were long in following the example shown by Cleveland; and to this day most of the iron furnaces are seen to be but copies of what the usual style of construction in England was before 1850. In 1865, however, it would appear that the first step in this direction was taken by M. Buttgenbach, the manager of the Neuss Iron Works, near Dusseldorf, in Rhenish, Prussia, who introduced his new system of blast furnace construction, which, although evidently based on that of the modern English furnace, differs from it in several details.

A model of his first furnace was placed in the Paris Exposition of 1867, where it received the only prize in its class, and is now in the Museum of the Ecole Centrale des Arts et Manufactures, in that city. Since then blast furnaces on this system have been erected at the Usines d'Anzin, near Valenciennes, at MM. de la Rochette's, and at MM. Harel & Cie.'s iron works, near Lyons; at the St. Louis Works, near Marseilles; and in Austria, at Inneberg, near Vienna, and at Putten, whilst various others are now in course of construction in both France and Germany. Descriptions and figures of the furnace will be found in the "Portfueille Economique" for October, 1869; the "Berg u. Huettin Zeitung" for 1870, p. 436; and still more recently, in Professor A. Kerpely's report, just published; and as this system is coming every day more into use on the Continent, as well as from its containing several features which may be found applicable to our own furnaces in England, we think it may not be out of place to direct attention to the mode of construction as now carried out.

The principle on which Herr Buttgenbach's system of construction is based, is that the shaft of the furnace itself shall be, as far as possible, isolated and independent, either of the base below, or the charging bridge above, in order that it may be enabled to expand and contract freely, without affecting the other parts of the structure. In order to effect this, the base of the furnace is formed of seven brick-work piers, disposed in a circle and inclining slightly inward, their tops being connected by arches and by a crown ring, which rests in a recess formed in the inner side of the ring of brick-work on the top of the piers. The shaft which rests on this crown ring is built of one ring of fire-clay blocks, molded to the proper form, and only 18 in. in thickness. The boshes meet the stack as usual, and at their widest parts are held in by the crown ring of the piers, both the stack and boshes being braced with iron hoops, and at their junction the boshes are protected by water boxes, which are likewise applied to the hearth and to the tuyeres and tymp arch. The top platform, bridge or charging gallery, as it is variously called, is not supported by and has no connection with the furnace shaft, but rests upon five hollow wrought iron columns, which spring from the top of the base, these columns serving as pipes for carrying down the gases from the furnace top into an annular reservoir, in which all the dust collects, and from which they are conducted to the boilers, air heating stoves, etc. At first glance it would appear that such thin walls would be likely to give rise to a considerable loss of heat from the cooling action of the surrounding air, but the experiences of seven years with two furnaces at the Neuss Iron Works, the one built on the old system of thick walls, and the other with walls only 18 inches thich, formed of only one ring of fire brick, without any other surrounding, have afforded practical proof that the new system is the more economical in working as regards the consumption of fuel; whilst these walls have the advantage of being more durable, since repairs can be made at any time during the working without the least difficulty, and any part of the wall can be examined by boring a hole of, say, one inch diameter through the fire brick, which affords the means of ascertaining, at any time or in any part of the shaft, as to how far it may be wore away on its inside; this small hole being kept closed by a clay plug, put in from the outside. Owing to the cooling action of the external air, the shaft, which, as before stated, is only 18 inches thick, during the 7 years which it has been in use at the Neuss Works, has not lost more than half an inch in thickness internally; it is braced every three feet with iron hoops 3 inches wide and ¼ inch thick, and has never shown any trace of gas escaping through its joints, whilst no damage or difficulty in recommencing work was found when, in the commencement of this year, the furnace had to cease working during 62 days, on account of insufficient supply of coals. This furnace, which is 53 feet in hight and 16 feet across the boshes, turns out nearly 50 tons fine grained pig iron, rich in manganese, per day, with a consumption of from 20 to 22 cwt. of coke per ton of pig iron, and in cost of erection can be built for at least 25 per cent. cheaper than one of the same dimensions but of the ordinary construction.

There is no cast iron used in the whole furnace, and the total weight of the hoops and braces does not amount to two tons. If the blocks of the shaft are to hand, such a furnace can be built within a month, and as no mortar is employed, the joints of the fire bricks being only cemented by a thin mixture of clay and water, the entire drying and heating previous to blowing in does not require longer than ten days.

Plating with Aluminum.

Seventeen years have passed since H. Deville first produced aluminum on a commercial scale; but the expectations regarding this very interesting and meritorious invention of the distinguished French chemist have not as yet been fulfilled. Although many of those expectations were somewhat exaggerated, they were not and are not so unreasonable as many people believed them to be; for a metal with so many valuable properties would be useful in many of the technical arts. Among these properties are a beautiful color that does not change in the air, nor yet in sulphurous exhalations, and further, remarkable lightness, an agreeable resonance, and a capability of being worked into any shape. Moreover, in the use or manipulation of aluminum there have not hitherto been observed any deleterious effects.

It is generally conceded that the cost, and not the absence of properties which make other metals valuable, has prevented the more extensive application of aluminum; and the price, although it is considerably less than it was at first, has remained high during the last few years. The cost of production of this metal, which can only be effected by the use of sodium, cannot possibly be the only cause of its high price; for the commercial manufacture of sodium may be considered as a solved problem, and, as soda ash is very cheap, sodium might be produced at a moderate cost if the demand were greater than it is. Large production is caused by large consumption, and the use of aluminum has been hitherto limited, mainly because custom and use have opposed the introduction of such a novelty. Stories have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead, and the formation of verdigris on spoons of (alloyed) silver; and if people were only determined to produce these utensils from aluminum, all danger from poisoning would be removed, and they would have vessels the appearance and durability of which would scarcely leave anything to desire. They would be more convenient to handle than our light crockery ware, for they can be made as light, and, what is important, cannot be broken. Splendid pitchers, plates, goblets, lamps, etc., might be manufactured from deadened and embossed aluminum; and the lightness of spoons of this metal would make them more convenient than those of silver now in use. In this case it is not the price, but only prejudice, which presents itself as a drawback, for the price is only half of that of good silver; beside, the difference in the specific weights of both metals and the consequent cheapness in the use of aluminum are so great that, for the value of one silver spoon, at least seven equally large aluminum spoons might be bought. True, aluminum is neither a rare nor a noble metal, but it possesses, nevertheless, advantages over alloyed silver which give it a much finer appearance; it does not get black, nor does it form verdigris, and what it lacks in brilliancy and appearance is well compensated for in its agreeable lightness.

The more important question which now deserves attention is: Whether it be not possible to plate certain metals and alloys, of unsatisfactory color, or which are subject to changes in the air, with aluminum, so as to give them, at least superficially, the advantages and properties of this beautiful metal? For this purpose, as so small a quantity is used to cover a large surface, the present high price would not be any drawback; and the question now remains: Is the coating of ordinary metals with aluminum practicable? This question has lately been propounded in the *Deutsche Industrie Zeitung* as follows: "Does any one know of a recent and reliable process for eletroplating other metals with aluminum or its alloys?" This question must be answered in the negative. There are, in general, two methods known, which are employed to coat one metal with another, viz., the galvanoplastic process and plating with foil. The separation of aluminum by the galvanic current succeeds only when the anhydrous double salt of chloride of aluminum and sodium is used; this salt melts at 185° C., and thus an incoherent coating only is obtained, which, beside, contains chloride of sodium, and is in no wise durable. From watery solutions, aluminum has not as yet been precipitated in a metallic state, and Gore certainly errs in stating that, with a weak current, copper may be plated with aluminum. In regard to plating with foils of this metal, it is possible in some degree, but the resulting product is perfectly useless. Plating in this manner requires a sort of brazing and a final intimate unification of both metals by rolling, and these conditions cannot be fulfilled with aluminum. As is well known, the ductility of this metal is almost destroyed by only a small admixture of other metals; iron makes it fragile, and copper imparts to it the brittleness of glass. Although it is possible to melt a sheet of aluminum upon another metal, an alloy is formed at the surface, by contact of the two metals, which possesses no ductility whatever, so that rolling crushes it to powder, and so the foil gets loose and separates. And even if it were possible to plate with aluminum, it remains very questionable whether there would be anything gained. Aluminum in a compact form is very durable, and not readily changed, either by oxygen or sulphur; but it is very changeable in a finely divided state. In sheets and powder it is very oxidizable, and when amalgamated it heats spontaneously in the air and separates into alumina and quicksilver. The layer of aluminum on the metal would in any case be very thin, and it is probable that this otherwise unalterable metal would lose its durability by the extreme tenuity.

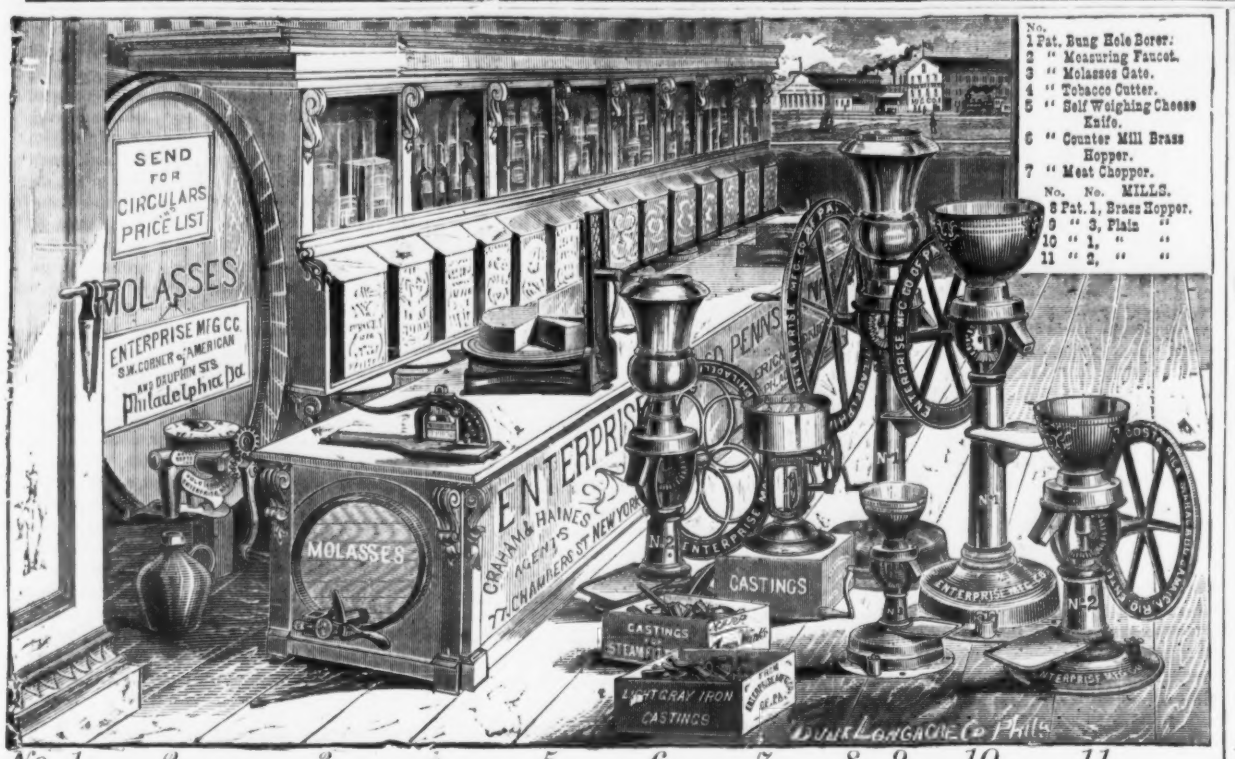
A New Method of Making Iron.

A new method of making wrought iron direct from the ore is now practiced in South Staffordshire, which is thus described: The inventors take the ore, grind it to powder, and mix with it powdered lime, together with powdered pitch or tar. When pitch is used, a little water is all that is needed to produce a mixture having much the appearance of dark mortar. In this shape the preparation is spread on the floor of a closed kiln, and treated pretty much like patent fuel. Here the moisture evaporates, but no portion of the metal producing ingredients is lost. In a few hours the kiln has a surface of metal coke usually four, and, if necessary, eight inches, thick. This is broken up into sizes adaptable to a heating furnace of the ordinary iron works class, where it is submitted to fire for half an hour at the utmost. In that time it is ready for the helve or squeezers, which it leaves a capital bloom, producing in the rolls a bar of half manufactured iron, known, under the old principle, as a puddled bar.

Thus the use of the blast furnace has been altogether avoided, and the work of converting the product of the blast furnace into partially manufactured iron, which has heretofore required the exercise of a large amount of troublesome skilled labor, has been effected by an operator who needs but very little practice to make him efficient. The other stages through which iron has to pass in order to the completing of the bar, or sheet, or plate, as the case may be, are the same as in the old process. The inventors, who are Messrs. Gerhard and Caddick, claim that they require only two tons of coal to make one ton of finished iron from the ore; that they can make German steel as cheaply as cast iron, and that they can manufacture cast iron equal in purity to charcoal iron without the use of charcoal, and they state that they have offers for all the finished iron they can make. The offers are, they explain, at prices which would leave a splendid margin of profit. The inventors are taking steps to form a company. If all that they claim to be able to do is practicable, a simplicity has been attained in the making of iron which should go far to reduce its price in those smaller sizes and shapes which are most of all applicable to the business of the general iron merchant.

A Great Blast of Granite.—Rock blasting is sometimes conducted upon an extensive scale in the granite quarries of Aberdeenshire, Scotland. An example of this was afforded recently by Mr. Fyfe, the enterprising proprietor of the well-known Kemnay Quarries near Aberdeen. That gentleman completed recently the preparations on which he has been engaged for about six months, with the view of having a rock-blasting experiment on a gigantic scale in his upper quarry. A large bore or mine was made in the rock at a depth of about 100 feet, extending forward in a straight line to a distance of 34 feet, then running to the left a farther distance of about 18 feet. Two tons of gunpowder were placed in this mine, and when three fuses had been properly laid in connection with the great quantity of explosive material, the mine was again built up, and then fired. The firing was quite successful. The shot took effect with very little noise, except a rumbling sound resembling distant thunder, and threw forward an immense quantity of rock, some large pieces being thrown to a considerable distance by the shock. Although the blast was very successful, and loosened many huge blocks of rock, the practical result was not so satisfactory as was anticipated by Mr. Fyfe, owing, it is supposed, to the charge being too great. Several years ago Mr. Fyfe used nitro-glycerine largely as his blasting agent, but owing to the foolish restrictions—amounting almost to complete prohibition—which were established by the panic stricken legislature, he was necessitated to limit himself to the use of gunpowder. Now that the manufacture of dynamite has become an established branch of industry in Scotland, there is some probability that, even with the restrictions imposed by the Nitro-Glycerine Act, the use of this exceedingly valuable blasting material will soon take root in the granite quarries of the far north; indeed, we learn that negotiations are already in progress for the establishment of a district agency in Aberdeenshire for the sale of dynamite, and for regulating its carriage and storage with all the care that is demanded in the interest of the public safety.

Sierra Madre Tunnel.—We learn from the *Denver News* that a company of capitalists are considering the practicability of tunneling the Rocky Mountains. The idea is to tunnel the mountains from a point about one mile below Black Hawk to the Middle Park, running in a northwesterly direction. The tunnel to be run will, it is presumed, cut many rich veins of gold and silver, and thus a great mining interest be developed. Money for the prosecution of the work has been subscribed, chiefly by English capitalists, who are sanguine of the ultimate success of the enterprise. The tunnel, when completed, will be 12 miles in length. It is intended to make it large enough to be used for railroad purposes, and so, if a railroad is ever to be constructed to the Middle Park, it will find its most convenient route through the tunnel. It will be called the Sierra Madre Tunnel, and the incorporation papers for its organization have already been filed. George W. Heaton, a gentleman well versed in matters of this kind, will have business charge of the operations of the company.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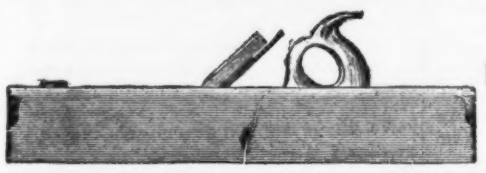

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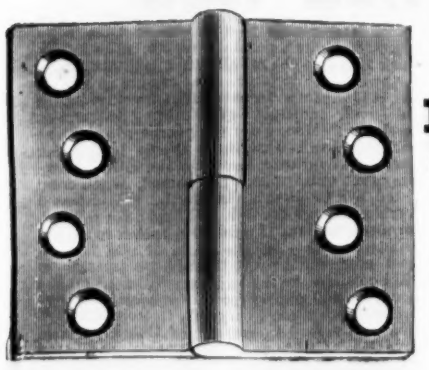

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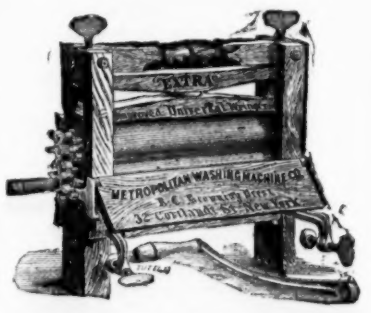

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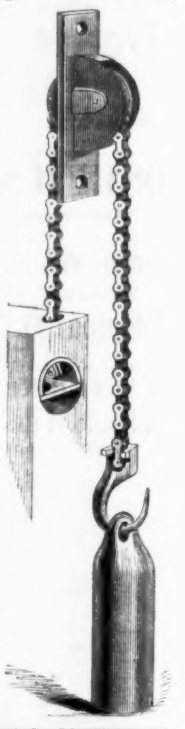

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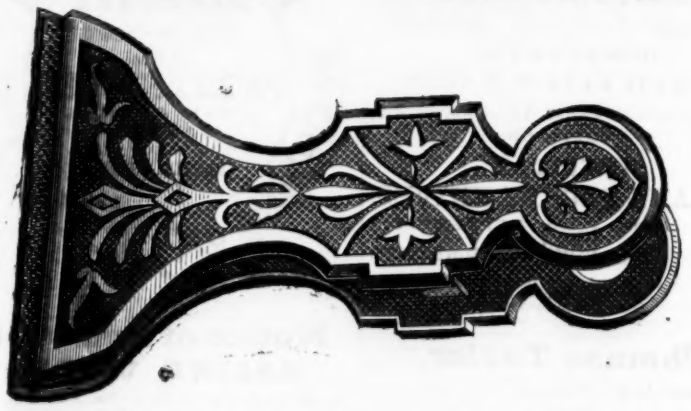

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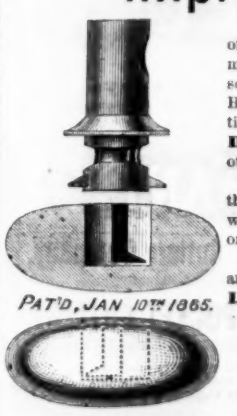

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Field Alfred & Co., 47 John, N. Y.....8
Hilger & Sons, 87 Chambers, N. Y.....16
King H. & J. W., 80 Chambers, N. Y.....11
E. Frith, 16 Cliff, N. Y.....8
Louderback, Gilbert & Co., 53 Chambers, N. Y.....15
Van Wart & McCoy, 43 Chambers, N. Y.....8
Turner R. A., 37 Chambers, N. Y.....11

Hardware Manufacturers.
Biddle Mfg. Co., 78 Chambers, N. Y.....16
Durrie Horace, 97 Chambers, N. Y.....28
Enterprise Mfg. Co., Phila.....12
Hart, Bliven & Mead Mfg. Co., 243 Pearl, N. Y.....12
Kellogg Wm. P. & Co., Troy, N. Y.....25
Lane, Gale & Co., Troy, N. Y.....8
Louderback, Gilbert & Co., 53 Chambers, N. Y.....15
Many F. L. & Marshall, 48 Warren, N. Y.....12
Middletown Tool Co., 82 Chambers, N. Y.....28
Miller's Falls Mfg. Co., 78 Beekman, N. Y.....25
Pratt & Co., Buffalo, N. Y.....16
Providence Tool Co., 11 Warren, N. Y.....14
Russell & Erwin Mfg. Co., 45 Chambers, N. Y.....14
Schweitzer Mfg. Co., 57 Reade, N. Y.....29
Shattuck W. F. & Co., 113 Chambers, N. Y.....8
Stanley Works, 58 Beekman, N. Y.....16
Taylor Mfg. Co., New Britain, Conn.....24
Turner, Seymour & Judds, 64 Duane, N. Y.....8
Union Mfg. Co., 55 Chambers, N. Y.....5
Williams, White & Churchill, 53 Warren, N. Y.....27
Wilson Mfg. Co., 37 Chambers, N. Y.....25

Hardware Specialties.
Biddle Mfg. Co., 78 Chambers, N. Y.....28
Haase John A., rear 116 Vanhorn, Phila.....9
Holton F. G. & Co., 124 Walnut, Cincinnati, O.....9
Louderback, Gilbert & Co., 53 Chambers, N. Y.....15
Semple, Birge & Co., St. Louis.....36

Helve Hammers, *Makers of.*
Bradley Mfg. Co., Syracuse, N. Y.....29

Hoisting Engines, *Makers of.*
Otis Bros. & Co., 348 Broadway, N. Y.....9

Horse Hay Forks and Fixtures, *Makers of.*
Nellis A. J. & Co., Pittsburgh, Pa.....36

Horse Nails, *Makers of.*
Ausable Horse Nail Co., 35 Chambers, N. Y.....36
Brundage & Co., Middletown, N. Y.....10
Globe Nail Co., Boston, Mass.....36
Pratt & Co., Buffalo, N. Y.....16
Putnam S. S. & Co., Neponset, Mass.....5

Horse Shoes, *Makers of.*
Burden Iron Works, Troy, N. Y.....4

Hubs and Spokes, *Mfrs. of.*
Gleason J., 2nd and Diamond, Phila.....30

Hydraulic Jacks.
Dudgeon Richard, 24 Columbia, N. Y.....35

Ice Cream Freezers, *Makers of.*
Torry E. S. & J., 166 Fulton, N. Y.....24

Insurance, Boiler.
Hartford Steam Boiler and Inspection Co.....29

Iron Brokers.
Boynton Geo. A., 70 Wall, N. Y.....6
Hazard & Jones, 212 Pearl, N. Y.....4
Petit Wm. H., 72 Wall, N. Y.....4

Iron, Corrugated, *Manufacturers of.*
Corrugated Metal Co., East Berlin, Conn.....4

Iron, Charcoal, *Warm or Cold Blast.*
Quincy John W., 98 William, N. Y.....4

Iron Commission Merchants.
Blakiston & Cox, 333 Walnut, Phila.....7
Hand Jas. C. & Co., 614 and 616 Market, Phila.....8
Hoopes W. Graham, 419 Walnut, Phila.....7
Malin Bros., 228 Dock, Phila.....7

Iron, Pig, *Importers of.*
Williamson James & Co., 69 Wall, N. Y.....4

Iron Dealers.
Abeel Brothers, 190 South, N. Y.....4
Bonnell, Botsford & Co., Youngstown, O.....4
Borden & Lovell, 70 and 71 West, N. Y.....4
Buchanan Geo., 19 Birchen Lane, London, E. C.....6
Cleveland, Brown & Co., Cleveland, O.....6
Coddington T. B. & Co., 25 Cliff, N. Y.....4
Conklin & Huerstel, 99 Market Slip, N. Y.....4
Fuller, Lord & Co., 139 Greenwich, N. Y.....4
Fuller, Dana & Fitz, 110 North, Boston.....2
Gardner Wm., 575 Grand, N. Y.....4
Hall, Kimbark & Co., Chicago.....6
Harrison & Gilloon, 558 to 562 Water, N. Y.....4
Hart E. R. & G. A., 208 Walnut, Phila.....7
Jackson & Chase, 206 and 208 Franklin, N. Y.....4
Judson B. F., 457 and 459 Water, N. Y.....4
Matthews Chas. W., 133 Walnut, Phila.....7
Packard, Goff & Co., Youngstown, O.....4
Pettee & Mann, 228 and 229 South, N. Y.....4
Piersons & Co., 24 Broadway, N. Y.....4
Pope Thos. J. & Bro., 292 Pearl, N. Y.....6
Quincy John W., 98 William, N. Y.....4
Richards D. W. & Co., 92 Mangin St., N. Y.....4
Smith Gam'l G. & Co., 342 Pearl, N. Y.....4
Warner A. B. & Sons, 28 and 29 West, N. Y.....4
Williamson James & Co., 69 Wall, N. Y.....4
Whitney Alfred R., 58 Hudson, N. Y.....4

Iron, *Manufacturers of.*
Cushong & Co., 31 Beekman, N. Y.....4
Britannia Iron Works, Middlesbro', Eng.....6
Burden Iron Works, Troy, N. Y.....4
Cartwright, McCurdy & Co., Cleveland, O.....6
Cleveland Rolling Mill Co., Cleveland, O.....6
Coffin Wm. E. & Co., 8 Oliver, Boston.....4
Ellis W. R. & Co., 17 Battery march, Boston.....4
Everson, Graff & Macrum, Pittsburgh, Pa.....4
Fulton S. & Co., 412 Walnut, Phila.....7
Jones & Laughlins, Pittsburgh, Pa.....4
Leonard John, 450 & 451 West st., N. Y.....4
Lynchburg Iron Works, Lynchburg, Va.....4
Milwaukee Iron Co., Milwaukee, Wis.....6
Niles Iron Co., Niles, O.....6
New Haven Rolling Mill Co., New Haven, Ct.....6
Old Dominion Iron & Nail Works Co., Richmond, Va. 6
Oxford Iron Co., 81 Washington, N. Y.....4
Phœnix Iron Co., 410 Walnut, Phila.....7
Rowland Wm. & Harvey, Phila.....36

Iron, Hoop, *Manufacturers of.*
Wm. Clark & Co., Pittsburgh, Pa.....4

Iron, Swedish, *Importers of.*
Jessop Wm. & Sons, 91 and 93 John, N. Y.....32
Mitander Nils, 69 William, N. Y.....4
Page Ewd. & Co., Boston, N. Y. and Phila.....4

Lace Leather, *Manufacturers of.*
Stoyle Wm. H., 403 Library, Phila.....15

Lanterns, *Manufacturers of.*
Dietz R. E., (Tubular) 54 and 56 Fulton, N. Y.....36
Howard & Morse, 45 Fulton, N. Y.....2

Lawn Mowers, *Manufacturers of.*
Chadborn & Coldwell Mfg. Co., Newburgh, N. Y.....29

Lead and Tin Lined Lead Pipe, etc., *Mfrs.*
Colwell Lead Co., 213 Centre, N. Y.....2

Locks, *Manufacturers of.*
Bohannan Wilson, Broadway and Kossuth, Brooklyn, E. D.....3
Branford Lock Works, Branford, Conn.....12
Norwich Lock Co., Norwich, Conn.....36
Romer & Co., Newark, N. J.....3
Sargent, Greenleaf & Cole, 300 Broadway, N. Y.....24
Trenton Lock Co., 48 Warren, N. Y.....12
Yale Lock Mfg. Co., 298 Broadway, N. Y.....16

Machinery, *Makers of.*
Billings & Spencer Co., Hartford, Conn.....7
Fishkill Landing Mch. Co., 63 Beecker, N. Y.....34
Gear A. S., 59 to 62 Sudbury, Boston.....34
Mason V. W. & Co., Providence, R. I.....34
Chapin Machine Co., New Hartford, Conn.....28
Paulding, Kemble & Co., 30 Broadway, N. Y.....9
Pratt & Whitney Co., Hartford, Conn.....34
Rollstone Machine Works, Fitchburg, Mass.....35
Sellers Wm. & Co., 1600 Hamilton, Phila.....34
Watson Andrew, 537 Dickinson, Phila.....35
Whitehill, Smith & Co., Newburgh, N. Y.....28

Machine Screws, *Makers of.*
Lyon & Fellows Mfg. Co., Williamsburg, N. Y.....7

Machinists.
Demarest, Joyce & Co., Brooklyn, E. D.....9
Ellis T. & Bro., 233 Court, Phila.....6

Machinists' Tools, *Makers of.*
Blaisdell P. & Co., Worcester, Mass.....35
Blundell Henry & Co., Providence, R. I.....35
Freeland Tool Works, 558 & 560 W. 34th, N. Y.....10
Harrington Edwin, 15th st. and Pa. ave., Phila.....35
Lincoln Geo. S. & Co., Hartford, Ct.....34

Malleable Iron Castings, *Makers of.*
Henry M. Filley, 2106 Market, St. Louis, Mo.....35

Meat Cutters, *Makers of.*
Newton D. A. & Co., 106 Chambers, N. Y.....10
Whittemore D. H., Worcester, Mass.....3

Metal Dealers and Brokers.
Belknap Aug., 48 Cliff, N. Y.....2
Coddington T. B. & Co., 25 and 27 Cliff, N. Y.....2
Cragin Bros. & Co., 141-5 Lake, Chicago, Ill.....2
Crane U. O., 134 John, N. Y.....2
Harnickel Max, 85 Beaver, N. Y.....2
Phelps, Dodge & Co., Cliff, bet. John & Fulton, N. Y. 2
Pope Thos. J. & Bro., 292 Pearl, N. Y.....2
Quincy J. W., 98 William, N. Y.....2
Thomson A. A. & Co., 213 and 215 Water, N. Y.....2
Van Wart & McCoy, 43 Chambers, N. Y.....2

Metallurgists.
Britton J. Blodgett, 389 Walnut, Phila.....14
Drown Thomas M., 1123 Girard, Phila.....14
Henderson James, 30 Broadway, N. Y.....14
Maynard & Van Rensselaer, 24 Cliff, N. Y.....14
School of Mines, E. 49th, N. Y.....14

Mining and Railroad Tools, &c., *Makers of.*
Washoe Tool Mfg. Co., 61 Park Place, N. Y.....15

Molders' Tools.
Carter H. & Sons, 290 Pearl, N. Y.....15

Monuments, *Granite and Bronze.*
National Fine Art Foundry, 218 E. 25th.....6

Mouse Traps, Catchemalive, *Makers of.*
Dietz R. E., 54 and 56 Fulton, N. Y.....36

Nickel Platers.
Smith L. A., 42 Mechanic st., Newark, N. J.....31

Norway Shapes, *Rollers of.*
Rowland Wm. & Harvey, 948 Beach, Phila.....36

Note Broker.
Gallaudet P. W., 3 and 5 Wall, N. Y.....4

Nuts, Bolts, etc., *Makers of.*
Ætna Nut Co., Southington, Conn.....14
Arms, Bell & Co., Youngstown, O.....14
Carpenter David, 402 Water, N. Y.....4
Clark Bros. & Co., Milldale, Conn.....30
Fuller, Lord & Co., Boonton, N. J.....4
Haskell W. H. & Co., Pawtucket, R. I.....14
Lewis, Oliver & Phillips, Pittsburgh and N. Y.....14
Plumb, Burdict & Barnard, Buffalo, N. Y.....36
Rhode Island Nut Co., 11 Warren, N. Y.....14
Sternbergh J. H., Reading, Pa.....14

Oilers, *Makers of.*
White J. H., Newark, N. J.....3

Ore Crushing Machines, *Makers of.*
Blake Crusher Co., New Haven, Conn.....34

Paints and Oils, *Dealers in.*
Devoe F. W. & Co., 117 Fulton, N. Y.....

Patent Adjustable Elbows.
Sargent, Greenleaf & Cole, 300 Broadway, N. Y.....13

Patent Solicitors.
Howson & Son, Phila. and Washington, D. C.....33
Leggett & Leggett, Washington, D. C.....8
Whitney J. A., 128 Broadway, N. Y.....33

Picture Nails, etc., *Manufacturers of.*
Richards T. C. & Co., 47 Murray, N. Y.....3

Pipes, Fittings, etc., *Makers of.*
Eaton & Cole, 59 John, N. Y.....7
McNab & Harlin Mfg. Co., 56 John, N. Y.....7
Nelson, Finkel & Co., 438 E. 10th st., N. Y.....7
Pancoast & Maule, 223 Pear, Phila.....7
Chas. Gregg Mfg. Co., 62 and 64 Gold, N. Y.....7

Pipe, Water and Gas, *Makers of.*
Brick R. A. & Co., 112 Leonard, N. Y.....6
Graff William & Co., Pittsburgh, Pa.....7
Morris, Tasker & Co., 15 Gold, N. Y.....7
National Tube Works Co., 78 William, N. Y.....7
Starr Jesse W. & Sons, Camden, N. J.....6
Warren Foundry & Mach. Co., Phillipsburg, N. J.....7
Wood R. D. & Co., 173 Broadway, N. Y.....6

Plane Irons, *Manufacturers of.*
Middletown Tool Co., Middletown, Conn.....28
Sandusky Tool Co., Sandusky, O.....12

Planes, *Manufacturers of.*
Greenfield Tool Co., Greenfield, Mass.....8
Sandusky Tool Co., Sandusky, O.....12
Stanley Rule & Level Co., 55 Chambers, N. Y.....8

Plumbago Lubricator.
N. Y. Black Lead Works, 172 Forsyth, N. Y.....

Plumbers' Materials, *Manufacturers of.*
Carr Wm. S. & Co., 106 Centre, N. Y.....7

Presses, Power, *Makers of.*
Am. Saw Co., 1 Ferry, N. Y.....36
Peck Milo & Co., New Haven, Ct.....28
The Stiles & Parker Press Co., Middletown, Ct.....35

Pressure Blowers, *Makers of.*
Blackburn, B. F., 11th and Hamilton, Phila.....36
Sturtevant B. F., 72 Sudbury, Boston.....35

Publishers.
Burr J. B. & Hyde, Hartford, Conn.....25

Pumps, *Makers of.*
Douglas W. & B., Middletown, Conn.....5
Rumsey & Co., Seneca Falls, N. Y.....5
Union Mfg. Co., 55 Chambers, N. Y.....5
Valley Mch. Co., Easthampton, Mass.....5

Rails, *Importers of.*
Congreve Chas. & Son, 104 and 106 John, N. Y.....32
Smith Gilead A. & Co., 62 Broadway, N. Y.....4

Rails, Iron or Steel, *Makers of.*
Atkins Bros., Pottsville, Pa.....6
Cambria Iron Co., Johnstown, Pa.....7
Cleveland Rolling Mill Co., Cleveland, O.....6
Evansville Rolling Mill Co., Evansville, Ind.....6
Griswold John A. & Co., Troy, N. Y.....32
Milwaukee Iron Co., Milwaukee, Wis.....6
Springfield Iron Co., Springfield, Ills.....4
The Cincinnati Railway Iron Works, Cincinnati, O..6
Joliet Iron & Steel Co., Joliet, Ills.....6

Razor Straps, *Makers of.*
B. F. Badger, 51 Elm, Charlestown, Mass.....12

Rolling Mill Machinery, etc., *Manufacturers of.*
Moore James, Cor. 16th and Buttonwood, Phila.....35

Rolls, Chilled and Sand, *Makers of.*
Garrison A. & Co., Pittsburgh, Pa.....4

Rules, *Manufacturers of.*
Chapin E. M., Pine Meadow, Ct.....5

Sash Chain.
Thomas Morton, 15 Murray, N. Y.....12

Saws, *Makers of.*
Atkins E. C. & Co., Indianapolis, Ind.....10
American Saw Co., 1 Ferry, N. Y.....10
Boynton E. M., 80 Beekman, N. Y.....10
Eccles James, 2423 Lombard, Phila.....10
Flint J., Rochester, N. Y.....10
Disston Henry & Sons, Phila.....10
McNeice Wm., 515 Cherry, Phila.....10
James Ohlen, Columbus, O.....10
Peace Harvey W., Williamsburg, N. Y.....10
Spear & Jackson, 116 Duane, N. Y.....16
Wheeler, Madden & Clemson, Middletown, N. Y.....10
Woodrough & McParlin, Cincinnati, O.....10
Worrall & Co., 28 Elm, N. Y.....10

Saw Frames, Wood, *Makers of.*
Peace Harvey W., Williamsburg, N. Y.....10

Scales, *Manufacturers of.*
Brandon Mfg. Co., Brandon, Vt.....9
Patterson Bros., 27 Park Row, N. Y.....36
Riehle Bros., 9th near Coates, Phila.....15
Shattuck W. F. & Co., 113 Chambers, N. Y.....8

Scissors, *Manufacturers of.*
Rowe & Post, 120 Chambers, N. Y.....11
U. S. Steel Shear Co., W. Meriden, Ct.....30

Screws, *Makers of.*
Miles F. S., 205 Quarry, Phila.....16

Screws, *Importers of.*
Bruce Geo. W., 1 Platt, N. Y.....31
Field Alfred & Co., 47 John, N. Y.....30
Gueutal George, 39 W. 4th, N. Y.....10

Shovels, &c.
Clement & Hawkes Mfg. Co., Northampton, Mass.....9

Smelting Works.
Du Plaine & Reeves, 709 S. Broad, Phila.....26

Stamped and Japanned Tin Ware.
Farrington J. D., Jr., 38 Murray, N. Y.....24
Shepard Sidney & Co., Buffalo, N. Y.....25

Steam Hammers, etc., *Makers of.*
Dudgeon Richard, 24 Columbia, N. Y.....35
Ferris & Miles, 24th and Wood, Phila.....35

Snaps, Harness, *Makers of.*
Middletown Tool Co., Middletown, Conn.....28

Speed Indicators, *Makers of.*
Connecticut Cutlery Co., Naugatuck, Conn.....31

Squares, Steel and Iron, *Makers of.*
Hart, Bliven & Mead Mfg. Co., 243 Pearl, N. Y.....9

Steam Pumps, etc., *Manufacturers of.*
Carr A, 43 Cortlandt.. N. Y.....29
Hall C. Henry & Co., 20 Cortlandt, N. Y.....7
Philadelphia Hydraulic Works, Evelina street, east of Third street, Phila.....35
Woodward Steam Pump Co., 76 Centre, N. Y.....6

Steel Importers.
Carr J. & Illey, 82 John, N. Y.....32
Cocker Bros., Sheffield, England.....32
Congreve Chas. & Son, 104 and 106 John, N. Y.....32
Hobson Francis & Son, 97 John, N. Y.....32
Jessop Wm. & Sons, 91 and 93 John, N. Y.....32
Moss F. W., 80 John, N. Y.....32
Piersons & Co., 24 Broadway, N. Y.....4
Sanderson Bros. & Co., 16 Cliff, N. Y.....32
Sanderson Geo. & Co., 57 John, N. Y.....32
Van Wart & McCoy, 43 Chambers, N. Y.....32
Wardlow S. & C., 12 Gold, N. Y.....32
W. Hawksworth, Ellison & Co., 72 John, N. Y.....32

Steel Manufacturers.
Anderson & Woods, Pittsburgh.....33
Aultman Steel Co., Canton, O.....32
Chrome Steel Co., Brooklyn, E. D.....33
Cleveland Rolling Mill Co., Cleveland, O.....6
Gautier D. G. & Co., Jersey City, N. J.....33
Griswold John A. & Co., Troy, N. Y.....32
Hussey, Wells & Co., Pittsburgh.....33
Miller, Barr & Parkin, Pittsburgh.....32
New Jersey Steel and Iron Co., Trenton, N. J.....33
Reese, Graff & Woods, Pittsburgh.....33
Reiter, Lavelly & Co., Pittsburgh.....33
Rowland Wm. & Harvey, 948 Beach, Phila.....36
Singer, Nimick & Co., Pittsburgh.....32

Stone Crushing Machines.
Blake Crusher Co., New Haven, Ct.....34

Stoves.
Resor William & Co., Cincinnati, O.....24

Stove Boards, *Manufacturers of.*
Shepard Sidney & Co., Buffalo, N. Y.....21

Stove Polish, *Makers of.*
Joseph Dixon Crucible Co., Jersey City, N. J.....36
"Gem" Stove Polish, 172 Forsyth, N. Y.....

Twist Drills, *Makers of.*
Morse Twist Drill & Mach. Co., N. Bedford, Mass....34

Tackle Blocks, *Makers of.*
Burr & Co., 31 Peck Slip N. Y.....37

Tacks.
American Tack Co., 117 Chambers, N. Y.....31
Field A. & Sons, Taunton, Mass.....31
Grundy & Kenworthy, 165 Greenwich, N. Y.....31
Dunbar, Hobart & Whidden, S. Abington, Mass.....31
Loring Samuel, Plymouth, Mass.....31

Tea Trays, *Importers of.*
Dickinson Henry, 66 and 68 Reade, N. Y.....11

Tinmen's Tools and Machines, *Makers of.*
Peck, Stow & Wilcox Co., 97 Chambers, N. Y.....16

Trowels, etc., *Makers of.*
Rose Wm. & Bros., 36th and Filbert, W. Phila.....10

Turbine Water Wheels, *Manufacturers of.*
Capron Water Wheel Co., Hudson, N. Y.....31
Whitehill, Smith & Co., Newburgh, N. Y.....28

Tubes, Seamless Brass and Copper, *Manufacturers of.*
Merchant & Co., 307 Market, Phila., Pa.....7

Tubes, Wrought and Galvanized, *Manufacturers of.*
Griffith I. J. & Bros., Philadelphia, Pa.....7

Tube Expanders.
Dudgeon Richard, 24 Columbia, N. Y.....35

Tuyeres, *Manufacturers of.*
Bayliss John, 157 East 54th, N. Y.....13

Valves, Gas, Water and Steam.
Ludlow Valve Mfg. Co., N. Y.....16

Vises.
Backus Vise Co., 78 Beekman, N. Y.....25
Fisher & Norris, Trenton, N. J.....25
Howard Iron Works, Buffalo, N. Y.....25
Wilson Mfg. Co., 37 Chambers N. Y.....25

White Lead, *Manufacturers of.*
Brooklyn White Lead Co., 89 Maiden Lane, N. Y.....29
Colgate Robert & Co., 287 Pearl, N. Y.....29
Cornell Lead Co., Buffalo, N. Y.....29
Jewett John & Sons, 182 Front, N. Y.....29
Lewis John T. & Bros., 231 S. Front, Phila., Pa.....29
Union White Lead Co., 26 Burling Slip, N. Y.....29

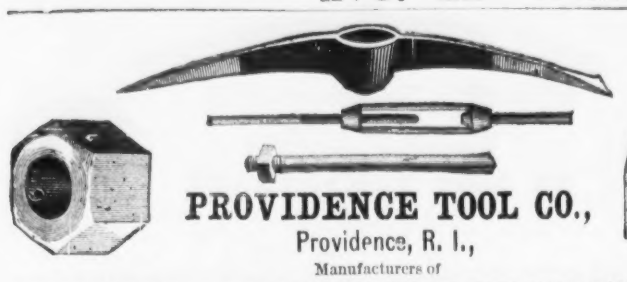
Wire, *Manufacturers of.*
Gilbert, Bennett & Co., 273 Pearl, N. Y.....2
New Haven Wire Co., New Haven, Conn.....3
Philadelphia Wire Works, N. 5th, Phila.....2
Prentiss Geo. W. & Co., Holyoke, Mass.....2
Townsend W. P. & Co., Pittsburgh, Pa.....4
Washburn & Moen Mfg. Co., Worcester, Mass.....2

Wire Goods, *Manufacturers of.*
Chicago Wire Cloth Mfg., Chicago, Ill.....2
Gilbert, Bennett & Co., 273 Pearl, N. Y.....2
Howard & Morse, 45 Fulton, N. Y.....2
Hopkins A. W., West Broadway, N. Y.....2
Howe, Bigelow & Co., Worcester, Mass.....2
Parker Sam'l & Co., Wethersfield, Ct.....2

Wire Rope, Iron and Steel, *Makers of.*
Roebling's John A. Sons, Trenton, N. J.....2

Wood Working Machinery, *Makers of.*
S. A

No. 11 Warren Street, NEW YORK.



PROVIDENCE TOOL CO.,

Providence, R. I.,

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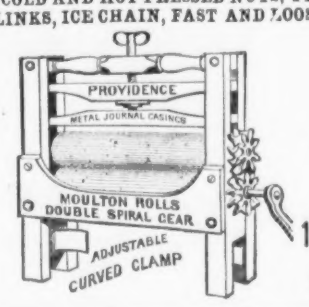
SQUARE AND HEXAGON COLD AND HOT PRESSED NUTS, PICKS, BOLT ENDS, TURN BUCKLES, CHAIN LINKS, ICE CHAIN, FAST AND LOOSE JOINT HINGES.

Providence Clothes Wringer Reliance Clothes Wringer



SHIP CHANDLERY OF All Descriptions.

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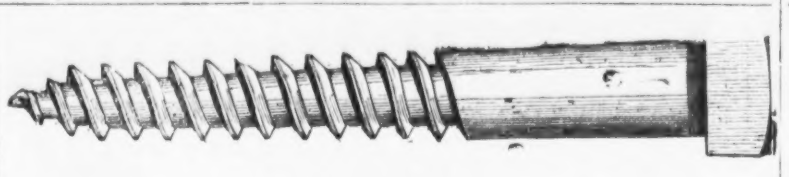
H. B. Newhall, Ag't.

NEW YORK.



WM. H. HASKELL & CO.,

Pawtucket, R. I.,

Manufacturers of

Machine and Plow Bolts,

Coach Screws, Set Screws & Tap Bolts.

Warerooms, No. 11 Warren Street, New York.

H. B. NEWHALL, Agent.

No. 11 Warren Street, NEW YORK.

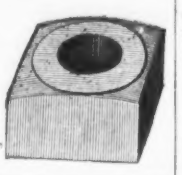
THE READING BOLT AND NUT WORKS.

OF

J. H. Sternbergh,

READING, PA.,

H. B. NEWHALL, Agent, New York,



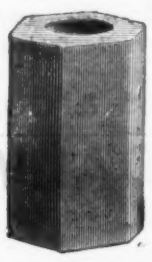
Manufacturing my own stock of Iron from the Pig Metal, and making all sizes of both Square and Hexagon Nuts for ¼ inch Rods and upward to 2 inch Rods, inclusive. I am able to control quality, and offer a superior article in either large or small quantities, at the lowest possible price.

No. 11 Warren Street, NEW YORK.

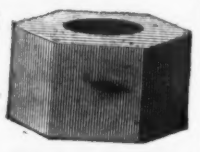
RHODE ISLAND NUT CO.,

Providence, R. I.,

Manufacturers of



Patent Rolled Hexagon Nuts, Rods and Tubing.



The Patent Rolled Nut is superior to the best Forged Nut.

In the Patent Rolled Nut the iron is not cut away or punched aside to form the hole, but is rolled over a rod by heavy iron rollers. This process refines the metal. Its fibers are not torn and shocked. It is cut without injury to the tap. The even surface and the general finish of the Nut commend it to machinists.

Warerooms! No. 11 Warren Street, New York.

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LEWIS, OLIVER & PHILLIPS,

MANUFACTURERS OF

Merchant Iron & Heavy Hardware,

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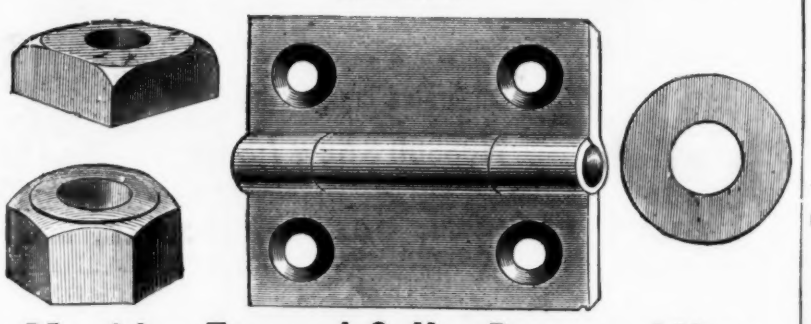

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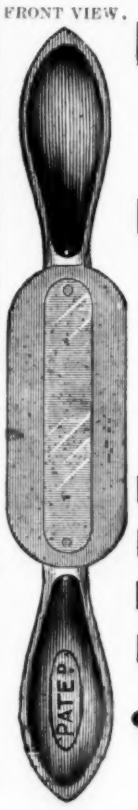

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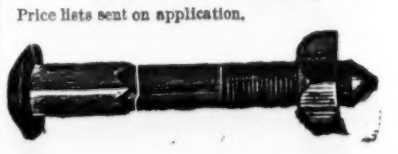

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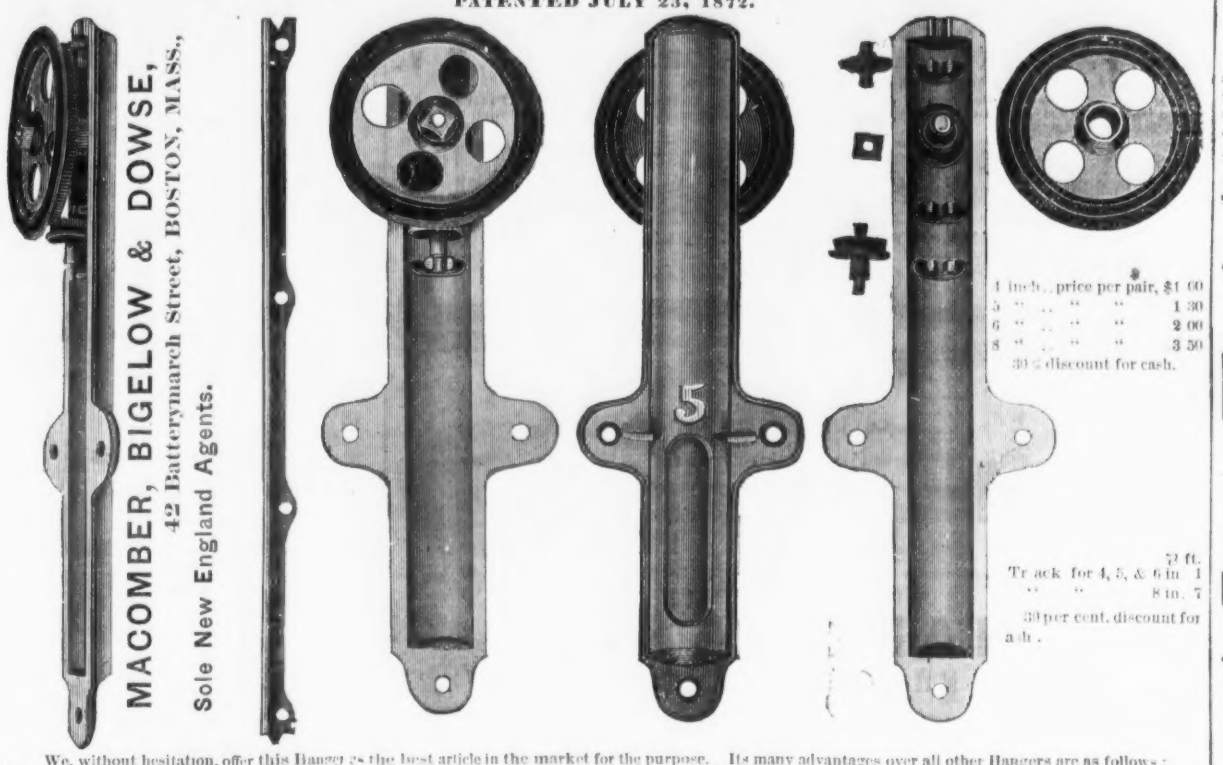

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4 inch.,	price per pair,	$1 00
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Track for 4, 5, & 6 in.	72 ft. 1
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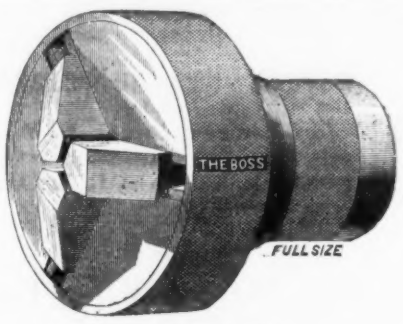

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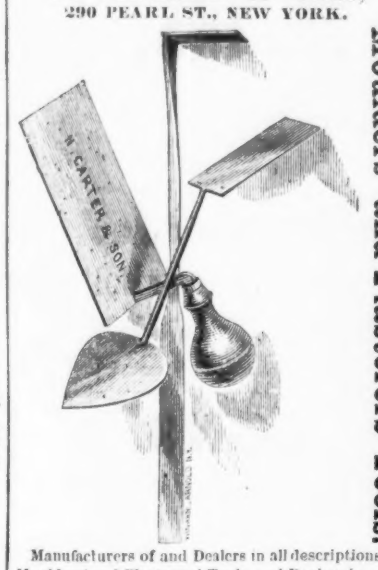

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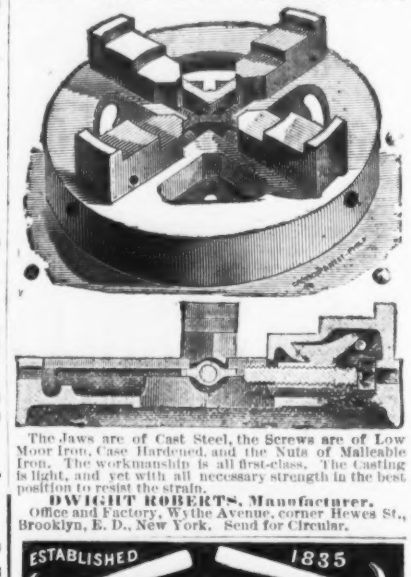

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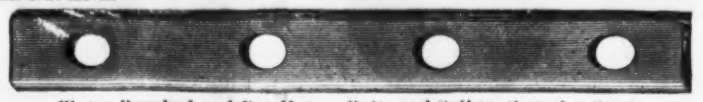

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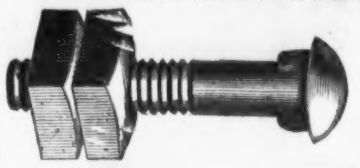

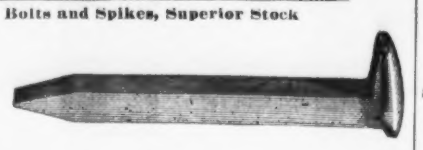

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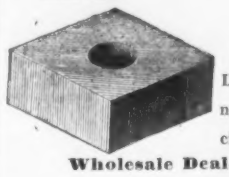

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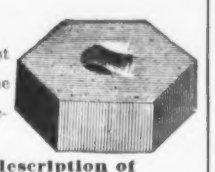

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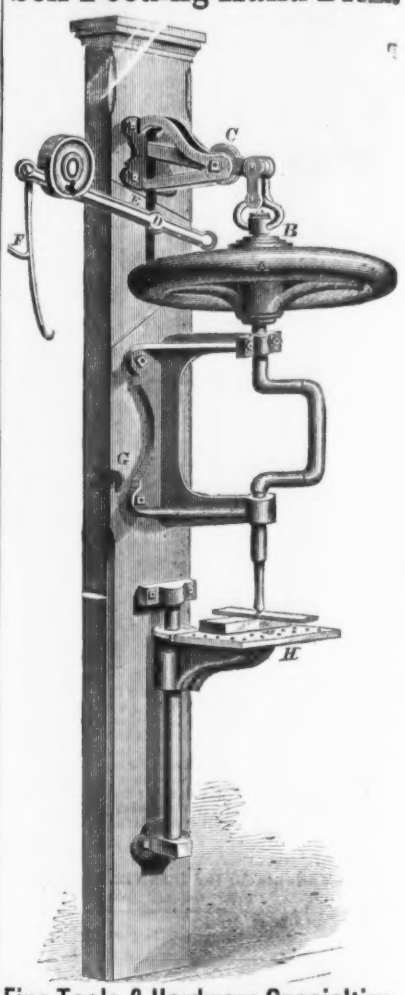

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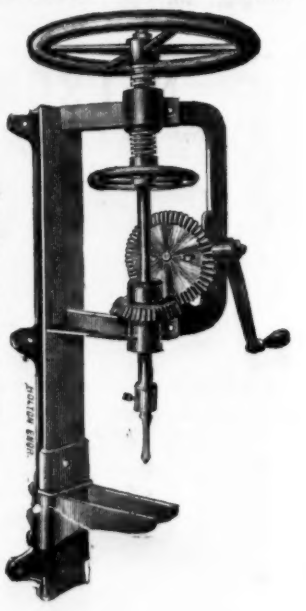

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A New Application of Electro-Magnetism to the Metal Industries.

Some three years ago a working electro-plater in London discovered a process by which a white metal having tin as its principal ingredient might be deposited by eletricity upon iron and steel, as well as upon copper and brass. Most of our readers know that to plate steel and iron even with silver has hitherto been deemed impossible, without the intervention of copper as a coating; and the process of tinning thin sheets of iron so as to make them tin plates is a familiar one. But to cover any metal with tin by the use of the galvanic bath is new. The invention is now in practical operation in Victoria street, Birmingham, where the Electro Stannus Company, who own the process, have their works.

The sal-ammoniac requisite in the making of tin plates, and which increases the disposition of the iron to rust, if only the air can get at it through the tiniest of imperfections, is not called for in this process. If the metal required to be coated should be rusty it is cleansed in a bath of sulphuric acid very much diluted; and when it has been immersed in a pot of potash and water, it has been freed from all grease. Now, chemically clean, it is fit for the plating vat. Here, hanging by copper wire from the metal bars which connects the battery with the opposite pole, the articles to be plated are hung in the solution, which, whilst it is not exclusively tin, may be practically regarded as tin. Immediately that galvanic action takes place the article is filmed with the white metal, and according as it is desired that the coating should be thick or thin, the time during which it is kept in contact with the solution is long or short. The article removed, it is found that it possesses a dull white colour that is made to acquire tolerable brightness by the application of the customary metallic brush moistened with a cleansing fluid. If a higher polish is required, then that may be obtained by the ordinary method of burnishing.

The process has evidently a wide field of application, and must be heartily welcomed by the numerous metallurgists of such towns as Birmingham and Sheffield. The French have lately been busy in giving a white metallic exterior to some of their fine ornamental castings. To such a purpose the process we have described is eminently applicable. And the better the casting the better the electro-plating; for it is more than likely that the chemical impurities of the common iron used in inferior castings would set up a local action in the bath, which would be troublesome to the operative, and prevent the effectiveness of the work. The process is manifestly more suitable to ornamental than to rough uses. The coating of iron with brass in the galvanic bath is usually a sorry affair, unless a thick coat of metal should be deposited. In the latter event the process is no doubt useful to give the appearance of brass to solid ironwork, such as the handles of railway carriage doors, to which it is extensively applied. But to give such a surface to less weighty articles would be to incur a cost greater than that resulting from the use of brass itself. For instance, to give a bowl of sheet iron the aspect of a brass bowl would cost more than to make the bowl of sheet brass, unless so filmy a coating should be applied that the foundation would quickly appear. So likewise in respect of the deposition of a cheap white metal by the electro process; the article so treated must not be subjected to much were and tear. It is being used to impart to massive iron hinges for internal use somewhat the apperance of silver. The effect is pleasing; but if it should be desired merely to protect the hinge from oxidation, the process would be serviceable and worth adopting.

This brings us to another use to which the process may be adapted. Assuming that the iron or steel to be operated upon is completely encased by the white metal, then corrosion is prevented. The process of coating plates with tin, as adopted by the tin-plate workers, is not always complete. Very minute spaces are now and then left uncovered. These the damp detects with unerring certainty, and soon a speak of rust appears, whose growth is rapid or slow according as the surrounding atmosphere is moist or dry. This defect the old tin-plate men sought to remove by blocking or planishing the plates after they were whitened. Hence we have the term block tin, which originally meant that the plates, after the tin had been placed upon them, were hammered upon a block in order that the tin might be beaten into such partially coated places. Where iron or steel is likely to be exposed to the influence of damp, either above ground or below, and it has not to bear friction, then, having been operated upon by the electro-stannus process, destruction by rust may be largely, if not effectually, prevented. Bedplates for hinges are being treated by the process that they may be kept from oxidation.

It has yet to be determined by experience whether this process will enable certain of the costly steamship fittings, now made of brass and copper, to be made henceforth of the cheap metals of iron and steel and yet be able to resist the effects of the saline atmosphere, and not unfrequently salt-water spray. The process is undoubtedly applicable to the keeping free from rust such engines, tools, and the like, as it is necessary should preserve their brightness *in transitu*. The friction of wear removes the white film which the process has thrown upon the tool, and the desired brightness of the steel appears untarnished.

There appears to be hardly any limit to the application of the method. We saw on the premises some iron bedsteads that had been sent to be covered with metal, whilst near at hand there were springs, alike large and small, to be used in mattresses. The springs had been coated, and had thereby obtained a prolonged lease of their life, at the same time that their appearance to the eye was greatly improved. If the bedstead maker wishes to keep his bedstead white under ordinary wear and tear, we do not think that this process will realize what he desires: the coating will wear off in the most exposed parts, and the foundation metal will be revealed. But there is no reason why the bedstead maker should not submit certain of the cast iron ornaments upon his goods to the process. The spring maker has been greatly benefited. Hitherto he has not been able to apply to his industry the benefits of galvanizing, on account of the effect upon the temper of the steel which the galvanizing process would produce. Now, however, both he and many others who have desired a means of protecting their manufactures against rust, and at the same time of increasing their attractiveness, possess a means of accomplishing both in this new mode of applying electro-magnetism to the metal industries.—*The Engineer.*

Mr. Bessemer's Channel Steamship.—The construction of the Bessemer saloon steamship has been inspected duriug the past month at the Hull Shipbuilding Yards of Earle's Shipbuilding and Engineering Company, by an influential deputation from the Bessemer Saloon Steamship Company. The framing of the ship is nearly complete, and the larger portion of the outer plating is worked upon it, so that a very good idea of the outlines, at least, of the ship was presented. The Bessemer steamer is 350 feet long, 40 feet broad inside of her paddle boxes, and of 2774 tons burden, B.M. She will be driven by two sets of paddle wheel engines, acting upon a double set of paddle wheels, situated 100 feet apart, the aggregate power of the engines being no less than 4600 I.H.P. Although the ship was ordered less than five months ago, the progress above indicated has already been made, and it is now obvious from an inspection of the vessel, even in her present condition, that she will be one of the most remarkable examples of novelty in steam navigation that the world has ever seen. The two ends of the ship alike will be furnished with rudders. It will be in the center of the ship, however, that its most characteristic feature will be found, for here will be placed her saloon, which will be 70 feet long and 30 feet wide, and suspended upon massive pivots at the center and at the extremities. Thus supported, it will be brought under the control of powerful hydraulic gear, worked by the principal boilers of the ship. This gear will be so arranged that it is expected a man will be able to impart to the saloon a rolling motion in relation to the ship precisely the reverse of that which the ship herself receives. The engine, it is anticipated, will drive the vessel at a speed exceeding 20 miles an hour.

The Detroit Tunnel Abandoned.—We take the following from the annual report of the Michigan Central Railroad Company: The Board regret to state that the work upon the small tunnel under the Detroit River, undertaken in part as a drainage sewer for the main tunnel, but also to test the nature of the earth under the river, has developed such difficulties as to compel them reluctantly to abandon that work. It is not necessary to describe those difficulties. Suffice it to say that the work of completing the small or drainage tunnel was originally estimated to require six months. At the end of two years the chief engineer states that it may possibly require six years to complete it. Fortunately he would not allow any expenditure upon the main tunnel until he was made certain of its feasibility, by that experiment. No large amount of money has been, therefore, expended in the work. It became certain that it would be several years before the main tunnel could be commenced, and a much longer time before it could be finished, if it were by possibility feasible at all. It was also clear that with the difficulties developed it would involve a much larger amount of money then could be commanded for that work. The only alternative is a bridge. At the last session of Congress a resolution was passed directing the Secretary of War to appoint a Commission of Engineers to investigate and report as to the feasibility of a bridge or bridges across the river. That Commission is now engaged in its duties, under an order of the Secretary, and will report at the next Congress. The necessity is so great, and it is so important for all interests in the West that they should be built, that it is believed the report will be favorable. In that case within a year a bridge at Detroit could be built, and all winter difficulties by the most convienient railway route would be at an end.

British Nail Makers.—In the official report of the inspectors of factories, which has just been issued, an interesting statement is made with regard to the nail makers. Mr. Walker, the assistant inspector, states that in some little communities, consisting chiefly of small workshops, the nail makers have, prior to the introduction of any factory legislation, made "a law unto themselves." As such an example out of many, he instances St. Niniam's and adjoining village of Whims of Milton, near Stirling, which is a Colony of nail makers numbering about 200 men, about thirty males under eighteen, and perhaps a third of these last under thirteen, a class of workers who in England do not possess, socially speaking, a very enviable reputation. In the above locality, however, the men choose there own hours of labor, and these sometimes excessive, but in no case do they employ their womankind, and in only a few their children. In regard to the latter, they are said to be very careful not to overweight them with any share of the severe toil they so freely impose on themselves.

An ingenious mechanic in Pennsylvania has invented a novel trap, which is said to successfully entrap the predatory rat by exciting his selfish passions. A local journal, describing the invention, says: A mirror is set in the back of the trap, and when the rat is out on a foraging expedition, he not only espies the bait, but at the same time believes his own image in the mirror to be another rat making for it on the opposite side. This is too much for rat nature to stand and be cool over, so he rushes for the bait, and meets his fate.

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The undersigned, commercial Editor of *El Cronista* the Spanish Government paper in this city, and Foreign Editor and Translator of the *Daily Bulletin*, has made it a specialty for years past to translate industrial matter, with the strictest adherence to the technical wording, from and into English, German, Spanish and French, for manufacturers, patentees and others, and begs to be recommended to the iron masters and trade in that capacity.

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Old Errors and New Truths Pertaining to the Crank Engine.

BY H. BOYNTON, M. E.

The object of this paper is to show wherein the books on practical mechanics are incorrect in their treatment of the crank engine, and to substitute practical truths, susceptible of the clearest demonstration, for the errors which now find general acceptance.

During the early use of steam as a motor in the mechanic arts, prominent English authors published their views of the transmissive properties of the crank engine, and upon these were predicated certain rules of practice, which, under foreign and American reprints, have been handed down to the present time. But those works embodied truths and falsehoods so sophistically interwoven, that their conclusions were false and their rules deceptive. Hence, we never attribute to steam its primary or inherent value as a motor, and never properly define its mechanical value as transmitted by the crank engine.

As the specific errors are universal, the rules are reliable for all comparisons, though unreliable for specific values.

It is the purpose of this paper to present the elementary values of steam as applied to and derived from the crank engine, in their true practical light; and in order to simplify the same to the ready appreciation of all readers, it will treat only of the capabilities of the steam —its pressures and velocities or values—and will introduce as few equations as possible, and only of elementary values.

Throughout the history of the steam engine there have been conflicting opinions in regard to the transmissive properties of the crank, in which one party has claimed that there was no loss of power by its obliquities, whilst the other has claimed a loss of 36·34 per cent. of the inherent value of the steam, since this percentage measures the difference between the power applied to the crank-pin and the average tangential resultant derived therefrom. Hence, discussions in mechanical journals and engineering works have been almost innumerable, and the sum of expenditures on experiments to produce estimated results, by governments as well as individuals, is immense.

The presumptive reason for a perpetuated conflict of opinions would seem to be, that both might be erroneous, else the true one would have been incontrovertible. Such is the real cause. Both are false and deceptive, and the practical truth is nearly midway between these extremes.

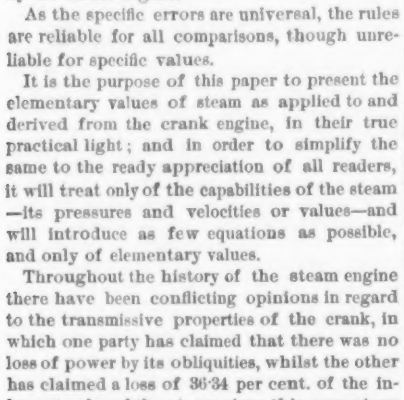
Hence, too, the rules as hitherto recognized, by which we speak of the inherent capabilities of steam, and of the mechanical value it develops, are calculated to and do mislead.

It should be observed that these practical values or engineering rules do not come under review in our academic or collegiate text books, else our scientists would long since have corrected the prevailing errors; and we have chosen new and different illustrations, in addition to those commonly used, to prevent the indiscriminations which have heretofore deceived so many.

VALUES OF OBLIQUELY DEVELOPED FORCE ILLUSTRATED.

We do not present an explanation of the well known law of parallelogram of forces because of novelty, but to derive the scientific relation of values, and show their applicability to the crank transmissions of power, so as to confine their use within legitimate limitations.

Fig. 1.



Let the circle at a, Fig. 1, represent a ball, and f force sufficient to carry it to b in an instant of time t; and f' sufficient to carry it to c in time t, and it is evident that under the same instantaneous action of $f f'$, that by virtue of f at the end of time t, a will be distant to b, and by virtue of f' it will be distant to c, and as it cannot move in both directions at the same time, it must move between them until these directions meet, as they will at d and at the end of time t, for the f direction carries it into the line $b\,d$, and the f' direction into $c\,d$; consequently, it moves through the diagonal $a\,d$ of their parallelogram $a\,b\,d\,c$.

If we change force f to the line F $a\,d$, it will carry a to b, equal to $a\,b$ in time t, and if we change f' to the same line, F $a\,d$, it will carry a to b', equal $a\,c$ in time t, and as either will carry it to $a\,b'$, both will carry it to twice $a\,b'$, equal to $a\,e$, in time, t.

Hence, $d\,e$ measures the difference between the direct and the oblique resultants, and it measures so much of the expenditures of $f\,f'$ as is developed by the obliquities to change the direction of f from $a\,b$, and f' from $a\,c$ to $a\,d$. This quantity thus expended is unknown in $a\,d$, because $f\,f' - d\,e$ equals $a\,d$.

Observe, that if we increase the obliquities more and more toward g and h we reduce $a\,d$ more and more till it equals zero, and if we lessen the obliquities more and more toward F a, we increase $a\,d$ more and more till it equals $a\,e$, and $d\,e$ equals zero.

Therefore, the diagonal force derived from obliquities of action can never equal its primary or primaries. The diagonal measures the utilized developments. The difference measures the developments without utility, or the power expended upon and lost through the obliquities.

THE SAME VALUES APPLICABLE TO THE OBLIQUITIES OF THE CRANK.

We now add the radius, or crank, $a\,s$, to which $a\,d$ is the tangent. We now have f rigidly intercepted by the crank in the direction $a\,s$, representing this angle of obliquity in the first half of the piston stroke, and f' intercepted in direction $s\,a$ as in the last half.

We now see that we have all the characteristic developments in action upon the crank-pin that we had upon mass a, though $a\,s$ is incompressible and unextensible, for if we increase the obliquities more and more toward g and h, we reduce $a\,d$ more and more until it equals zero, and f acts lengthwise of $a\,s$ to compress and f' to extend it, and if we lessen the obliquities more and more toward F a, we increase $a\,d$ more and more, and until $d\,e$ equals zero, and both forces act tangentially to their radius and $a\,d$ equals $a\,e$.

Since $a\,s$ is rigid in directions $a\,s$ or $s\,a$, it is evident that if we remove f' the developments of f cannot be varied thereby, and if we remove f those of f' cannot be varied, when we have either force equal to $a\,b$ or $a\,c$, with tangential resultant equal to $\frac{a\,d}{2}$, or $a\,i$, and its unutilized development equal to $\frac{d\,e}{2}$, or $i\,b'$.

Therefore, the law of parallelogram forces is strictly and correctly applicable to the obliquities to the crank.

We remark that the development of power which is not utilized through obliquities of action, is accounted for by scientists under two theories, those of Newton and De Alembert; the first, that the intercepted action in line of crank develops from itself a reactionary force sufficient to change its residue from its line of impossible motion to its possible, or tangential, direction; and the second, that the primary force in its line of application possesses constituents that are instantly developed in the impracticable and practicable directions. But as both theories agree exactly in resultants unutilized and utilized, either may be accepted.

Therefore we establish the following truths:

1st. That the elementary laws of science in relation to the compound developments of force or forces, are strictly applicable to the crank engine developments.

2d. That no resultant of oblique acting force or forces can equal its primary or primaries.

3d. That as every application of the power of steam to the crank engine is more or less oblique—excepting at the tangential point in the mean part of the stroke—the sum of their resultants cannot equal the sum of their primaries.

4th. Therefore, there are developments of power through the obliquities to the crank that are unknown in the mechanical resultants, and are absolutely and irrecoverably lost.

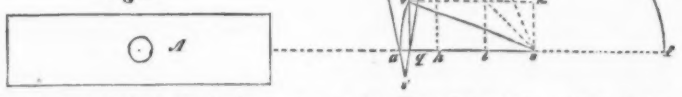
DETAIL APPLICATION OF VALUES TO THE CRANK ENGINE.

Whilst these truths thus established are correctly treated in detail by our standard works on the steam engine, they are so deceptively and falsely applied to practice as to entirely contradict them. Hence we give detailed application of these truths.

Power, in simple mechanics, is instantly transmitted, but in compound mechanics there is interception and change of direction, or compound developments, before or simultaneous with transmission; hence anti-mechanical phenomena are produced, and these have been perverted in their application so as to give prominence to entirely erroneous conclusions.

We therefore give a detail illustration of the correct application of values by Fig. 2, in which A represents an oscillating cylinder, connected to crank $a\,s$ at a. And we suppose the rod A a infinitely long, so that its action through the arc $a\,e$ is practically always parallel to itself.

Fig. 2.



We divide the first half of the stroke, or $a\,e$, into four equal spaces, as at a, b, c, d, e, and to the first space $a\,b$, the perpendicular $b\,g$ shows $a\,g$ to be the movement of the piston, as $a\,b$ is that of the crank-pin, and $a\,b$ as (very nearly) five times $a\,g$.

We resolve the obliquities to the arc $a\,b$, as in Fig. 1, and their tangential average is (very nearly) ·2 or one-fifth of their primaries. (We shall show hereinafter that their mechanical values are a little over one-fourth of their primaries.)

Although this is the correct tangential average of these obliquities, we shall define their special application in order to prevent the common errors of practice, and correct the common misapplication of truths.

We take the functions of the steam in A as equal to 100 lbs. or pressure p, through $a\,b$, equal to 5 feet, or space s, in one second, or time t, when $s\,t$ equals 5 feet per second, or velocity v. Hence, the primary or inherent power of the steam equals 100 lbs. $\times\, v$ or $p\,v$.

Its tangential value is, $\cdot 2\,p\,v$ or 20 lbs. $\times\, v$.

Their difference is $p\,v - \cdot 2\,p\,v = \cdot 8\,p\,v$ or 80 lbs. $\times\, v$.

This difference is lost, and this quantity of power has no tangential effect whatever in direction $a\,b$. It represents so much of the steam in A, represented by $a\,g$, as is developed through these obliquities to produce their diminutive tangential resultants. We see where the power is developed as in Fig. 1, and it is "lost power," although we know where it is developed as well as the man that sees his watch fall from his hands to the depths of mid ocean, and because the one is as irrecoverable as the other.

We further illustrate by contrasting these values with simple mechanical transmissions, for by the obliquities we have compound developments of force before transmissions. We construct from the center at s' the arm $s'\,a'$ equal to radius $a\,s$, with $a\,s'$ equal to $\frac{a\,s}{5}$, so that $a\,g$ (the motion of piston) is common to both, then the arc $a'\,b'$ equals $a\,b$.

We assume the action of A through $a\,g$ to be tangential, when disconnected from $a\,s$ and connected at a to $s'\,a'$, and as $p\,v$ equals 100 lbs. on the crank-pin through $a\,b$, or 5 feet, in one second, it equals 100 lbs. through $a\,g\left(=\frac{a\,b}{5}\right)$ in one-fifth of a second. Hence, the steam in $a\,b = p\,v$, and in $a\,g$ it equals $p\,v$, as 1 foot in one-fifth of a second is at same velocity v, as five feet in one second.

Therefore, by the laws of simple mechanics, since $a'\,b' = 5 \times a\,g$, we have $\frac{100}{5}$ lbs. (or 20 lbs. $= \cdot 2\,p$) through $a'\,b'$ in one-fifth of a second, or at velocity $5\,v$ (being 5 feet in one-fifth second) or $\cdot 2\,p \times 5\,v = p\,v$.

In $a\,b$ we can by no possibility derive from $p\,v$ more than 20 lbs. 5 feet in one second, whilst in $a'\,b'$ we have 20 lbs. five feet in one-fifth of a second. Hence, the resultant in $a\,b$ equals $\cdot 2\,p\,v$, that in $a'\,b'$, $\cdot 2\,p \times 5\,v = p\,v$. The difference equals $p\,v - \cdot 2\,p\,v = \cdot 8\,p\,v$, which is lost by the obliquities.

Or if we will reduce the time in $a\,b$ to one-fifth second as in $a'\,b'$, we must reduce the 20 lbs. in $a\,b$ to one-fifth, or 4 lbs., when we have $\cdot 04\,p \times 5\,v = \cdot 2\,p\,v$.

But in $a'\,b'$ we have $\cdot 2\,p \times 5\,v$, and we deduct $\cdot 04\,p \times 5\,v$ which leaves $\cdot 16\,p \times 5\,v$, or 16 lbs. 5 feet in one-fifth second, which is lost by the obliquities in $a\,b$.

Therefore, whatever the defined power of A, through the first and last eighth, making one-fourth of the crank-pin stroke of the engine, their average of tangential resultants only equals one-fifth of their primary.

Their difference or four-fifths of their primary is lost.

The rule of practice arbitrarily gives this steam, represented by $a\,g$, only one-fifth of its inherent value. It says, since the piston moves only 1 foot in 1 second, that the functions of the steam only equal $p \times \frac{v}{5}$ or $p \times \cdot 2\,v$. This is a delusion, as this rule takes the pressure on piston into velocity of piston to measure the functions of the steam, or its primary power.

But if 100 lbs. 1 foot in 1 second, or $p \times \cdot 2\,v$, equals the functions of the steam, then it cannot exert a pressure of 100 lbs. upon the 5 feet in $a\,b$ in 1 second any more than it can upon 500 feet in 1 second. All that it can do in $a\,b$ is to exert $\frac{100}{5}$ lbs. $\times\, v = \cdot 2\,p\,v$, or 20 lbs. 5 feet in 1 second, and the tangential resultant therefrom cannot exceed $\frac{20}{5}$ lbs. or 4 lbs. $\times 5$ feet in 1 second, which equals $\cdot 04\,p\,v$.

But this is false and arbitrarily or ignorantly deceptive, because the steam possesses the known functions of 100 lbs. pressure upon the crank-pin, with a subtlety of development or intensity of velocity competent to impress itself on every mechanical point in $a\,b$ in 1 second. Hence, $p\,v$ is the measure of the steam, and not $p \times \cdot 2\,v$.

But $p\,v$ represents the pressure on the crank-pin into its velocity in $a\,b$, and $p \times \cdot 2\,v$ represents the pressure on the crank-pin into one-fifth of its velocity, or the velocity of piston, which latter value is an absurdity, if given as a pretension for the real value of the steam.

If we resume the examination for the other arcs, $b\,c$, $c\,d$ and $d\,e$, we in a similar manner derive their specific relations, but this is unnecessary, as it is a well known truth that the average tangential value through the crank-pin stroke is 63·66 per cent. of the applied value.

That the difference equals 36·34 per cent. of the applied value.

These considerations, therefore, establish these important practical truths, viz.:

1st. That the primary power of the steam equals the pressure on the crank-pin into its velocity, or $p\,v$.

2d. That the intercepted power developed to produce change of directions from the lines of application to the tangents of the arc, equals 36·34 per cent. of the primary power, or, ·3634 $p\,v$.

3d. That the average tangential resultants from the obliquities to the crank equal 63·66 per cent. of the primary power, or ·6366 $p\,v$.

PREVAILING ERRORS.

The extraordinary phenomena of the crank engine obliquities, in which one end of the connecting rod, at the crank-pin, moves 10 feet, while its other end only moves 6·366 feet, has been used to cover up the practical truths here presented, and so misapply them as to completely falsify the true relations of values.

In deriving the power of the steam in A we have the known pressure p and an unknown velocity, which we must derive from the apparent duty of the steam. And as the steam exerts its functions on every point—mechanical or mathematical—in the crank-pin arc $a\,b$, which has five times as many points of development as there are in $a\,g$, and, also, as the steam produces the greater velocity in $a\,b$, and the lesser velocity in $a\,g$ only equals one-fifth of the greater, it follows that the greater or crank-pin velocity, only, can measure the full power of the steam; hence, that the piston velocity only measures a diminutive part of it.

First Error: In taking the pressure on the piston into velocity of piston as equal to the primary power of the steam.

The sophistry that has maintained this error is very extraordinary, and rests upon an abandonment of a large percentage of power, or an omission to notice a large known development.

Thus, in the illustration of Fig. 2, they deduct or omit to notice $\cdot 8\,p\,v$, and because its remainder or $\cdot 2\,p\,v$ equals $p \times \cdot 2\,v$ (of which $\cdot 2\,v$ equals velocity of piston) it is made the standard for full valuation of steam.

Therefore, the least apparent duty, or $p \times$ the slow piston velocity, is made the standard valuation of steam, and arbitrarily so, or without reason or regard to the greater apparent duty of $p \times$ the greater crank-pin velocity. Although eight-tenths of $p\,v$ is unutilized, and only two-tenths utilized, in $a\,b$, the greater apparent duty of $p\,v$ at the crank-pin is just as absolute and just as apparent as the lesser apparent duty of two-tenths of it where the crank-pin load controls the piston, for the latter is subjective to the former developments, because the greater can always control the lesser.

In applying the same rule to the full stroke, the connecting rod being incompressible and inextensible, so that the pressure at the crank pin end is identical with that at the piston end, it omits to notice $p\,v$ at the crank pin, of which $\cdot 3634\,p\,v$ is developed to produce the tangential residuaries of $\cdot 6366\,p\,v$, and then because this residuary or fractional part of $p\,v$ corresponds in value with another fractional part of the same steam, which has a crank-pin pressure p, but a subjective velocity of $\cdot 6366\,v$, so that this $p \times \cdot 6366\,v$ piston fraction is the equivalent of $\cdot 6366\,p \times v$ crank-pin fraction; therefore, either fraction must equal the whole of which it is a part.

This is the rule of practical mechanics and this is the sophistry that sustains it.

We may observe in explanation that the load due to $p\,v$ steam at crank-pin equals $l\,v$, the average residuary equals $\cdot 6366\,l\,v$. The difference not utilized in load equals $\cdot 3634\,l\,v$, and their sum equals $p\,v$. The piston moves at $\cdot 6366\,v$, but if disconnected from the crank it will move at v, with load l, hence, to reduce it to crank-pin time, we must increase the load to $1{\cdot}5708\,l$, when we have $1{\cdot}5708\,l \times \cdot 6366\,v$ equals $l\,v$. This equals the tangential load plus the lost developments, or $p\,v$.

Second Error. Is the assumption that the crank is not a constant radius, but an imaginary lever with variable radii for every possible subdivision of the crank.

The assumption is arbitrarily false because the crank is a constant radius; and is grossly deceptive because it supersedes all obliquities. Thus it assumes that the action through the arc $a\,b$, is equivalent to the engines being disconnected at a and b and connected at s so as to slide up an imaginary lever $k\,s$ to k, when $k\,s$ is radius and not $b\,s$. But this is absurd, since $b\,s$ is the radius and $k\,s$ is the sine of the angle of obliquity, and $b\,s$ minus $k\,s$ (or rad.—sin.) equals $c\,k$, which measures so much of A as is unknown tangentially, and $k\,s$ so much as is utilized.

Therefore these errors can only have been resorted to as coerced alternations for covering the incompetencies of the crank.

MECHANICAL VALUE.

We have before mentioned the conflicting opinions we have thus far reviewed, and that the practical truths pertaining to the crank lay nearly midway between the extremes. And whilst the steam is properly represented by the pressure on the crank-pin into its velocity, and the tangential average of the obliquities equals 63·66 per cent. of this value, the difference being a loss, the practical average or mechanical value exceeds this tangential quantity, and equals 78·54 per cent. of the steam. Hence, the loss is less than that attributed to the obliquities, scientifically considered, and equals 21·46 per cent. of the steam.

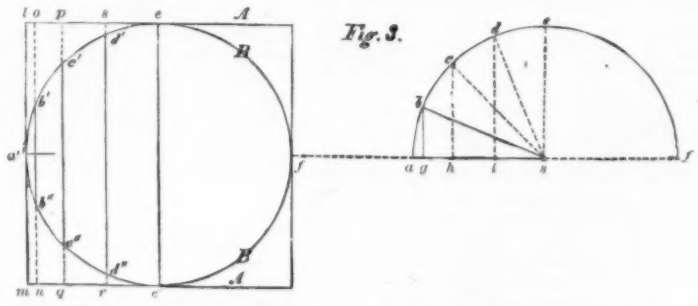
Hence, also, the mechanical value exceeds that which the deceptive rule of the books attributes to it.

We now inquire as to the mechanical value of the steam as derived through the crank obliquities.

It is obvious that an equal cubic quantity of steam expended on each obliquity, as in the action of gravitation upon the obliquities of an inclined plane, would render the tangential and mechanical values identical. But this is impossible by the crank, for the quantity of steam expended varies with each obliquity; therefore, we must take the quantity to each obliquity, and the sum of these products measures the mechanical value.

We illustrate by Fig. 3, and have divided the first half of the crank-pin stroke into four equal spaces, $a\,b$, $b\,c$, $c\,d$ and $d\,e$, and we let fall the perpendiculars from these points, a, b, c, d and e, upon $a\,s$, when the spaces $a\,g$, $g\,h$, $h\,i$ and $i\,s$ measure the cubic quantity of steam to their respective crank-pin movements. And we learn that the steam from b to c, c to d and d to e is respectively 2·9, 4·3 and 5·1 times that from a to b; and, also, that the tangential values increase in the same ratio, for whilst the sine of the angle of obliquity measures the tangential value, the versed sine measures the quantity, and these both increase from zero to radius, whilst the sum of their products measures their mechanical value. These, mathematically (or integrated), equal ·7854 of their primary.

Fig. 3.



We illustrate these relations of values approximately by taking measured quantities and averaged values to the four spaces, as they will be more generally understood, and the quantity in $a\,e$ being 1, and the tangential value at e being 1, we have quantity:

From	equals	and tang'l average is	their product is
a to b	·075	·1920	·0144
b to c	·217	·5455	·1184
c to d	·335	·8160	·2652
d to e	·383	·9625	·3686
Quantity, 1·000		Av. 4) 2·5160 (·6290.	Total ·7666

The measurement average in $a\,e$ is necessarily below the mathematical (or integrated) values. Hence, their product is below, and as ·7666 is below ·7854 of the steam.

The difference between the primary and the utilized equals 21·46 per cent. of the steam, and is a loss of power, or has no mechanical resultant whatever, but equals the sum of the developments or expended power upon the obliquities to produce the derived mechanical utility.

And the mechanical or utilized power equals 78·54 per cent. of the steam.

PRIMARY, TANGENTIAL AND MECHANICAL VALUES ILLUSTRATED IN COMBINATION.

We may now illustrate the primary, tangential and mechanical values in combination, and so that the evidence of each is at once correctly defined to the eye at every obliquity, and with well known total values.

We substitute for the cylinder engine A, in Fig. 2, the square sided engine A A, Fig. 3, the length and diameter of which equal twice the radius $a\,s$, and its parallel sides are sufficiently apart to make its cubic contents equal to those of cylinder A in the former figure. Within the square we inscribe, with same radius, the circle B B and divide the arc $a\,e'$ as we did the crank-pin arc $a\,e$, and through the points a', b', c', d' and e' draw diametrical lines from the sides A A, when the area of their respective parallelograms will measure the quantity of steam to each crank-pin space in arc $a\,e$, and the quantities are then as $l\,o$, $o\,p$, $p\,s$ and $s\,e'$.

We notice that the chords of the circle at a' b' c' d' e' are to the diametrical lines at l o p s e' as the sines of the angles of obliquity at a b c d e are to radius. We have, therefore, the threefold values, primary, tangential and mechanical, respectively represented by the diametrical lines, the chords and the circle, the circle being to the square as the mechanical value is to the primary.

We observe that the quantity of steam represented by the circle at every chord in $a'\,e'$ is precisely equal, when in tangential action, to the quantity represented by the square at the extension of each chord respectively to the sides A A, when in their oblique action upon the crank; for the quantities in oblique action are always as the diameter and its tangential value as the chord, and the quantity in mechanical action is always as the chord and the tangential value as the diameter, therefore, they are precise equivalents.

We see that zero steam at a in tangential action equals $l\,m$ steam in oblique action, and b' b'' steam in tangential action at b equals $o\,n$ steam in oblique action, and every intermediate chord in the segment in like manner equals in mechanical value its diametrical extension in its anti-mechanical or derived value.

Hence, the quantity of steam represented by the segment a' b' b'' in mechanical action, is the precise equivalent of the quantity represented by the parallelogram $l\,m\,n\,o$, in its anti-mechanical action through $a\,b$.

We remark than when considering the illustration by Fig. 2, of the same arc $a\,b$, we derived the tangential as only one-fifth of the primary value for the first and last eighth of the stroke. The mechanical value exceeds one-fourth of the primary, which is in the relation of the segment to the parallelogram, and because of similar relations of quantities and values through the obliquities in $a\,b$, as before considered in relation to the arc $a\,e$.

In relation to the remaining parallelograms and zones in the arc $b'\,e'$, their respective representations are precise equivalents.

Hence, the relations which are true of the first half are true of the second half of the engine.

Consequently, the quantity of steam represented by the square develops through the crank obliquities mechanical equivalents precisely equal to the quantity represented by the inscribed circle, and is equal to 78·54 per cent. of the power of the steam.

We therefore establish the following practical truths.

1st. That the primary power of the steam is represented by the pressure of the diameters into the crank-pin arc, or $p\,v$, as the pressure on, into the velocity of, the crank-pin.

2d. That the tangential resultant is represented by the average of the chords of the inscribed circle, and equals ·6366 $p\,v$.

3d. That the mechanical power of the steam is represented by the quantity of the circle, the quantity of the square being the primary, and equals ·7854 $p\,v$.

4th. That the power lost through the obliquities is represented by the quantity of the square minus that of the circle, and equal, ·2146 $p\,v$.

(To be Continued.)

The Pascal Iron Works.

By far the most important establishment of its kind on the American continent, if not in the world, both with regard to capacity and the magnitude of its operations, and the extent and thoroughness of its equipments, is the Pascal Iron Works of Messrs. Morris, Tasker & Co., of Philadelphia. We cannot hope to give in the limited space of a magazine article any other than a meagre description of an establishment so colossal, but shall simply present, in the following sketch, the impression drawn from a visit some weeks ago, and a necessarily hurried inspection of the bewildering variety of mechanical appliances and operations there witnessed.

From certain reliable data which have come into the writer's possession, the following facts, relating to the history of this establishment, have been obtained—while the contrast between the unimportant beginning of the enterprise and its present colossal proportions is the only evidence that need be offered of the far-sighted intelligence and business talent of its founders.

The origin of the Pascal Iron Works was coincident and nearly connected with the introduction of coal gas into the city of Philadelphia. The beginning of the establishment must be traced to the year 1821, in which year Stephen P. Morris commenced the business of manufacturing stoves, grates, etc. In 1835 Messrs. Stephen P. Morris, Henry Morris, and Thomas T. Tasker, Sr., were associated together in the manufacture of stoves, ranges, &c., having their establishment at Third and Walnut streets, where are now located the central offices of the present company, and business is now carried on by the sons of Thomas T. Tasker, Sr., but still under the title of Morris, Tasker & Co. In the same year, which happened also to be the date of the introduction of gas into the city, a proposition was made to the firm by Mr. William Griffiths, a skilled workman, lately arrived from England, to enter into the manufacture of gas pipe, a branch of manufacture hitherto confined to England, whence it had, up to this time, been exclusively imported to meet the growing demand for it in this country, where the introduction of gas works was rapidly making its way.

The proposition of Mr. Griffiths was favorably considered, and the manufacture of gas pipe was added to the products of the establishment. Thus was inaugurated an industry which, dating its origin with the infancy of gas lighting in the country, has grown with its growth, until it has matured with the great house whose workshops cover acres of ground and give employment to thousands of hands, whose products may yearly be valued by millions, and which, in its vast proportions, the completeness of its appointments, the system of its management and the variety of its manufactures, is a noble monument to its founders, and a model among many model establishments in Philadelphia.

It soon appeared, however, to the originators of the enterprise, that the process of pipe making, as practiced in England, was highly imperfect, and that, to prosecute successfully the business they had entered upon, the appliances employed must be remodelled or altogether discarded, and new machinery devised for the purpose. To illustrate the crudity of the methods then employed, it is needless to say more than that the threads for coupling the pipes together were cut by turning the pipes in the dies by hand. As the result of this necessity, the firm commenced, in 1836, the erection of new buildings at their present location, under the name of the "Pascal Iron Works." The earliest works formed a nucleus, about which successive additions have since been made, from time to time, until to-day they comprise an area of twelve acres, covering two entire squares, bounded by Third and Fifth in one direction, and by Morris and Tasker streets in the other, not including a large edifice on the opposite side of Morris street. Two-thirds of this space is entirely covered by buildings.

To the manufacture, at first of gas pipe, was regularly added the production of other and related articles, such as gas fittings and gas fitters' tools. From this there followed naturally the construction of the machinery for generating, washing, purifying and storing illuminating gas. Then followed the manufacture of pipes for other purposes, tubes for conveying water, lap-welded boiler tubes, and boilers themselves, water fittings, hot water apparatus of various kinds, for dwellings, public and private, and for the most varied uses, together with the tools necessary for the erection of the same, apparatus for effecting the ventilation of buildings, &c. In fact, the establishment at present manufactures every variety of apparatus required to light, heat, ventilate or supply with water, buildings of any description.

There are in constant operation in the works twelve boilers and seven steam engines, representing a total aggregate of one thousand horse-power. The engines, in distant parts of the vast range of shops, are supplied with steam by long lines of well coated steam-pipes, which, in several instances, are over 600 feet from the boilers. A great number of furnaces for heating the bent pipe, preparatory to welding them, are to be seen in the pipe mills, while in the smith's shop are others; and in the several machine shops there are in operation an almost endless variety of machine tools for special purposes, representing the best makers of Philadelphia and elsewhere; lathes, machines for planing, screw-cutting machines, shaping machines, drill presses, machines for boring, tap-cutting, grinding, and polishing metal, &c., are here in busy employment, exercising there various functions. In the tube-mills no lines of shafting are visible, the same being placed beneath the flooring, thus effecting a great saving of valuable space, and adding greatly to the convenience of the operators.

All the machinery of the establishment is present in duplicate, to meet any exigency which might arise from breakage or other cause; so that it is scarcely probable that any disaster could occur which would cause the suspension of any of the operations of the establishment for more than twenty-four hours.

All of the newer portions of the buildings have been constructed with a view of making them thoroughly fireproof; while within the main building, where they can be instantly made available in case of such an emergency, are a series of steam-pipes connected directly with the boilers, each of them leading to one of the numerous departments of the house, and so marked with prominent letters. Should a fire break out in the most distant portion of the establishment, as soon as the signal could be given, a flood of steam would be poured in upon it, by the simple turning of the valve of the appropriate pipe, so affording perhaps the most efficient means of controlling such an accident that could be devised.

The establishment affords employment to about 1600 workmen, though the number is subject to slight variations, according to the variations in the press of work at different seasons. At the time of the writer's visit, about 1600 hands were employed. Only two-thirds of these are at work during the day, and they are relieved by fresh relays at evening—the pipe-mills being kept in constant operation day and night.

The best starting place for a description of the varied details of the establishment is the gas-pipe mill. Here the operation of heating the strips of iron plate, and of bending and welding them into tubes, is conducted. For this purpose, there are arrayed on one side of the large stone building, a row of a dozen or more reverberatory furnaces, called in shop phraseology the "skelp" and welding furnaces; "*skelp*" being the term applied to the bent tube preparatory to welding it. Directly in front of each of the furnaces are placed the bending or welding tables. Each of these is provided with a peculiarly constructed tool having movable jaws, which can be set to any suitable width, to accommodate itself to the size of pipe required. These are set to the proper size by one of the workmen in charge at every change of order; though, from the nicety of the operation, it is found desirable to run the largest lot of orders upon one setting, which obviates what would otherwise necessitate the loss of much valuable time. Before the jaws just mentioned, is seen a species of carriage, which can be made to traverse the whole length of the bending or welding table by being thrown into gear with an endless chain placed immediately beneath its surface, and which is operated directly from the main line of shafting which passes beneath the flooring. To this carriage can be attached a pair of self-acting tongs, by which the end of the bent pipe emerging through the jaws can be firmly grasped, and the carriage with it travels the length of the table. The construction of the jaws and their operation is a most satisfactory subject for the inspection of one who is interested in mechanical devices, and affords perhaps as perfect an illustration of the successful application of a machine for a special purpose that could be furnished. It would be clearly impossible to force a flat sheet of heated metal immediately through a circular opening—and recognizing this difficulty, the jaws are so constructed as to gradually adapt the flat sheet to its circular form. This is accomplished by making the curvature of the jaws not sharp, but very gradually increase from flatness to the final curvature required. The operation of bending and welding the tubes is now about as follows: The strips of metal, cut of proper length and width, are placed in the heating furnaces until heated to the proper heat for bending, which is a matter of some importance, and one requiring the eye of an experienced workman; since, if not hot enough, the operation will be frequently interrupted by the sticking of the "skelp" in the jaws. When the heating is sufficient, a workman raises the door of the furnace, seizes the end of one of the heated strips, and forces it as far as he is able though the covering jaws; a die of the proper size is held in its groove, and the jaws, previously set to the proper calibre, are closed upon it. The projecting end is now grasped by the waiting tongs of the traversing carriage. This is in an instant thrown into gear by another attendant, and off it travels, dragging after it the bent sheet, until it is freed from the jaws. In its present condition it has the form of a tube, but its edges are still at some distance apart, having been kept so by a bit in the die, which fixed it in the jaws. The object of this slight parting of the edges is to avoid the undercurling, which would be sure to take place in the welding operation which the tube must next undergo, if the edges were brought near enough together to touch. The apparatus for welding the bent sheet is almost identical with that employed in the bending process just described, except that the form of the jaws is of somewhat different shape, to adapt them to their somewhat modified function. The "skelp," or half-formed tube, is next placed in the welding furnace until properly heated, and is then similarly forced through the aperture in the jaws, which are so designed as to exert a great pressure upon all sides of the tube. Thus the open edges of the "skelp" are brought together with great force, and firmly united. The form of the joint or seam thus made is called the "but-weld," the edges being simply united by contact under great pressure, and no lapping involved. This is the nature of the weld universally employed for pipes which are designed for service where but little strain will be exercised upon them, such as pipes for conveying gas, water, &c. In other forms of pipe, designed for boiler tubes, well-tubes, steam conveyers, &c., which will be called upon to withstand unusual strains, a joint of extraordinary strength, known as the "lap-weld" is given them, rendering them as homogenous in structure as though no joint had been effected, and no more liable to break at the joint than at some other part of their structure. After the welding above described, the pipes are subjected to a simple rolling process, to render them perfectly straight and round, and after cooling, are taken to the finishing rooms to be cut to proper lengths, supplied with screw threads at the ends, and sockets for connection, tested by hydraulic pressure as to their freedom from flaws, and then, if approved, assorted into bundles convenient for transportation. The screw-cutting machines, of which there are twenty or more in this department, are models of machines for special work, and are designed to combine, under the management of one skilled workman, a number of separate functions. The same machine cuts off the end of the pipe squarely, cuts the screw thread upon it; and the motion being reversed to remove the freshly-cut thread from the dies, the other end of the pipe, previously furnished with a thread, is, by the reversed motion, screwed into the socket. To effect these manifold operations, the pipe is placed in a rotating cylinder, in one end of which is a chuck to hold the pipe; and the whole is revolved by a cross belt from the main shaft. The chuck is provided with dies, which are brought together by turning a head screw, while a cutter head with cutter operated by hand, is just in front of the chuck. With the screw-cutting machines in this department, it is possible to turn out over six thousand finished pipes per day; each of them requiring but the attendance of one workman. The socket-tapping machines, also in this department, have perpendicular spindles, driven by a vertical shaft connected with the main shaft by a bevel wheel and pinion. The socket is held in a square chuck, which opens and shuts by the turning of a hand-screw. But one workman is required to operate four of the tools, and will be able to cut from six to eight thousand sockets per day. Other machines are employed upon the work of finishing the gas and steam fittings required to join the ends of pipes. These are of a variety of forms, necessitating the tapping of holes in different directions for Ts, Ls, crosses, &c., and the machine is modified to meet the necessities of the case. A plain disk of steel, without teeth, in another part of this apartment, to which great speed is given, is busily employed in cutting off pipes. The pipe is made to revolve upon rollers, and is fed up to the rotating disk, which does its work in an instant. In the process of finishing pipes for transportation, the workman in charge of the screw-cutting tool tests the quality of the metal of each sample by hammering down to a sharp bend, the scrap cut off from the ends. Should it splinter under the hammer, the pipe is rejected without further ado. But after passing through this general test of its excellence, it goes to the hands of another workman, whose duty it is to subject it to hydraulic pressure, to make assurance doubly sure. According as the pipe is destined to be employed, it is subjected to a greater or less strain, which it must successfully withstand before being considered in fit condition to be sent out from the establishment. For the purpose of this test, the pipe is placed in a species of trough, and firmly screwed into a pipe connected with a powerful force pump, while the other end is as firmly closed by screwing up against a solid head furnished with a leather washer. Thus positioned, the pump is set into operation, forcing water into the pipe, and exerting, of course, an immense strain upon it equally in all directions, and throughout its entire length. A valve, set to open at any desired pressure, terminates the test, when the pipe has reached that pressure and successfully passed this final and thorough ordeal by opening and allowing the confined water to discharge itself. Should the slightest flaw, invisible to the naked eye, exist in any of the pipes, or should the metal composing them not be homogeneous in texture, but from any cause weak in certain spots, though this may escape exposure beneath the hammer of the finisher, the hydraulic test will infallibly seek out the weak spots and expose the existence of the flaws. Nothing like an imperfection can possibly escape the searching examination to which the pipe is here subjected. And if this test is successfully withstood, the pipe will, with absolute certainty, resist a strain up to the limit to which it has thus been proved. The pipes which have stood the proof are then passed to other workmen, who stamp them with the name of the establishment, and they are then packed into bundles preparatory to being shipped. It might be added, also, that there are some half-dozen of these testing machines in the finishing department, all of them in constant operation. The strain applied to various pipes is greater or less, as has already been remarked, according to the character of the work they are destined to perform. For gas, water, and steam pipes, they are all proved to a pressure of three hundred pounds per square inch; for pipes destined for oil or artesian wells, or similar use, under circumstances where they will be subjected to unusual pressures, the strain which they are required to withstand in the testing machine is raised to one thousand pounds.

From the foregoing it will have been made evident that the manufacture of a pipe is not a simple operation requiring but little care or good management, but really a highly complex one, involving a number of distinct stages, each of them demanding, in its turn, a new process and special machinery; and that the utmost care and the most refined philosophical appliances are called into requisition to insure its quality before it is ready to perform its allotted service.

From the manufacture of the simple "butt-welded" pipes, the next operation of the establishment which would naturally follow in order is the manufacture of boiler tubes. The operations here carried on are of the most interesting character, the process being likewise more complicated in character than those previously described. The engine driving the machinery of this bending mill is supplied with steam from a distance of 600 feet from the boilers. It is of 40 horse-power, with 16 inch cylinder and 20 inch stroke, making 79 revolutions per minute, and was built by Hoff, Fontaine & Abbot, of the Eagle Works, of Philadelphia. It will readily be understood that for tubes which are to be employed as steam pipes, or within boilers or wells and the like, a joint of greater strength than the simple "butt-weld" is absolutely necessary; and to meet this necessity, these pipes are made with a lapped joint, and are known in shop phraseology as lap welded tubes. In order that their edges shall lap, and still be free from undercurling or greater thickness at the line of joining, it is found necessary to "scarf" the edges of the sheets, preparatory to their introduction into the furnaces. This scarfing process consists simply in traversing the sheets, cut down to the exact width required of them, successively through a tool furnished with cutters placed at the proper angle, by which a shaving is sheared off from both sides, leaving a sharp, bevelled edge along the whole length of the sheet. These may then be subsequently lapped, without causing the piling of a double thickness of metal at the line of union. After the "scarfing" operation has been completed, the sheets so treated are, as before described, brought into the bending furnaces, and pass through exactly the same treatment as in the case of gas pipe. After traversing the jaws, the "skelf" or imperfect tube is, upon cooling, transferred to the welding furnace, to be perfected. The operations of "scafing" and bending the lap-welded tubes are carried on in a large apartment adjoining the vast welding mill, to which we will next proceed.

Directly adjacent to this "boiler tube mill" are located—though considerably depressed below the floor-level of the former—the 12 compound tubular boilers of the establishment, which supply with power all its departments. The steam from these is conveyed through arched tunnels, in well jacketed pipes, to the various points where it is needed for distribution. The tube-mill itself is a vast apartment over 400 feet in length; and distributed at regular distances throughout its extent are 18 large reverberatory furnaces, from which the "skelp" from the department above described is fed into the rolls in the welding process. The blast for the furnaces is furnished from two great blowers, built in the works and located near the center of the apartment. The engine driving the rolls and other machinery of this department is the largest in this establishment, is of 125 horse-power, was built by the well known firm of I. P. Morris & Co., of Philadelphia, and has a 22½ inch cylinder, 4 foot stroke, making 47 turns per minute. The engine is of double construction, both vertical and horizontal, the design of duplication being, as remarked in the outset of this sketch, to render the establishment independent of any accidental breaks which might otherwise occasion embarrassing delays. One of the engines is operated for six months of the year, and is then relieved of duty for the remainder of the year, being subjected, before going on duty again, to a thorough overhauling for any repairs which may be found necessary. The line shafting of the tube mill is located, as in the previously named instances, entirely under ground, and is about 1200 feet long. The products of combustion from all the furnaces are led by underground flues into one huge smoke-stack, 150 feet high, situated at one side of the great apartment, through which they escape. As to the capacity of the furnaces in the mill, it may be remarked, aside from the incidental fact that they are kept in constant operation day and night, until it is found necessary to stop one or more of them for repairs, that each is capable of finishing from 20 to 225 pipes per day, according to the size of the product turned out. Extending along the front of the range of furnaces is a long series of roll-trains, through which the "skelp" from the welding-furnaces, heated to the welding heat, is forced. The operation of lap-welding requires, however, another process of manufacture than in the case of butt-welding at first described. The vastly increased strength demanded of the products of this process, demands that the weld shall be a far more perfect one than was the case with the butt-welded tubes. To secure this, however, it is necessary to subject the tube to a much higher pressure in the welding process. This again requires, in order to avoid the undercurling of the bevelled edges of the "skelp," that the pressure shall be applied both to the inside and outside of the tubes. To accomplish this, a mandrel is employed of the proper dimensions and a slightly conical form, which is carried upon the end of an iron rod somewhat smaller than the interior diameter of the tube to be welded. This is forced into the interior of the pipe, as the end of the pipe first enters the rolls, and the pipe is forced out of it, throughout its entire length. Thus the combined results of a powerful pressure, both from without and within is effected, and the structure of the joint made perfectly homogeneous with the remainder of the pipe. The mandrel, after performing its function, drops from the further end of the pipe, destroyed by the tremendous operation through which it has passed—and a fresh one is needed for every tube which passes through the rolls. It is hardly necessary to say that the mandrels must be manufactured with the utmost precision. They are taken from the foundry where they have been cast, and finished with accuracy in a special department. The operation of lap-welding, as it is constantly carried on in this department, is of the most striking character, and at once rivets the attention and affords great interest to the stranger who witnesses it. The imperfectly formed tubes from the bending mill are placed in the welding furnaces, and when heated to their proper temperature, are seized by the waiting workman, and the end thrust between the revolving rolls. Here it is caught by both rolls and mandrel, and by the former it is rapidly carried through them; the whole operation, after the tube emerges from the furnace, does not occupy more than a few seconds; and the appearance of the swiftly projected, glowing mass, emitting a series of sharp reports as loud as the discharge of a volley of musketry, repeated every minute from one or the other of the 18 furnaces, is so curious and unlike anything else that one has ever before observed, that in spite of the intolerable heat from the furnaces and from the heaps of finished tubes scattered in profusion about the furnaces, one is never tired of witnessing the repetition of the novel spectacle. After proper cooling, the now perfectly welded tube is taken into the finishing department, and there goes through the same operations of squaring up, receiving screw-threads on its ends, and passing the hydraulic test, and bundling for transportation, which have also been described in a former portion of this article. The extent of the production of lap welded tubes by this establishment is simply enormous, amounting to ten miles per diem. They are employed in every portion of the continent, for the greatest variety of uses; and so great is the demand for them that, despite the vast facilities of the establishment, they are seldom up with their orders in supplying them.

With the machinery at present in operation the factory is enabled to manufacture tubes of this description of all sizes up to 8 ⅝ inches, and which, it is needless to say, is a feat which cannot be accomplished by any other establishment of a similar kind in the country; and machinery is now being erected by which tubes of twelve inches in diameter can be manufactured. All of the tubes pass through the same processes, receive the same attention and are equally perfect in construction, as none but the best American charcoal iron is employed in their manufacture.

We have devoted so much space to the description of the processes involved in the manufacture of tubes, because it is the most abundant and by far the most interesting product of this great factory. But let it not be imagined that this is the sole product there manufactured; on the contrary, it would be a hopeless task to attempt even the enumeration of the almost infinite variety of products in those branches of industry which are closely related to the employment of gas and water, steam and air, in every conceivable form of public or domestic use. To these related products belong the machinery necessary in the manufacture of illuminating gas. And to state the case in brief—the establishment possesses the most ample facilities for erecting a gas works complete from the very beginning, the retorts and buildings involved, to the gas holder for storing the gas; and, not to stop here—for the pipes for supplying and distributing it from the works to the house of the consumer, with all the variety of fittings of cast or wrought iron which can be imagined, and even the tools for the gas fitter's trade, are here produced. In the construction of hot water and steam heating apparatus, the establishment has long been famous. One of the forms of hot water furnaces designed by Mr. Thomas T. Tasker, formerly of the firm, has received most flattering commendation from the Committee of Science and Arts of the Franklin Institute.—*American Exchange and Review.*

An English View of the Situation.

The following letter from a British merchant to the London *Times*, relative to the state of the iron market, will be read with interest:

SIR: I venture to solicit your powerful aid in calling attention to the present critical state of one of the most important trades in the country, viz., the iron trade.

I need scarcely recount the history of the last two years, as it is, no doubt, well known to most of us that the trade has passed through a season of great prosperity, during which the difficulty has been to make iron fast enough to meet the demand. The natural consequence inevitably followed, and prices were forced up to a point which entirely put a stop to the demand from abroad. This was the state of things just a year ago, and in the month of October the manufacturers, finding themselves with little or nothing to do, reduced the price £4 per ton, with the effect of causing a revival of the demand, so that in January prices again began to advance, until they reached the same point as they had attained last year, and with the same result: viz., an immediate and complete cessation of the demand from abroad.

During these violent fluctuations in this country the Americans have been steadily and rapidly extending their works, until, at the present moment, not only is it next to impossible to sell English iron in the United States, but we find the American ironmasters competing with us in the Canadian market. Meanwhile, the price of English iron has already declined £2 per ton without having any appreciable effect whatever upon the demand, and I think it may be taken for granted, from the experience of last year, that at least another £2 per ton must come off before we can look for any revival.

If this were all, however, I should not have thought it worth while to trouble you with the present communication, but have left demand and supply to regulate prices, as they surely will do in time. I greatly fear, however, that with every month's continuance of the present scale of prices our foreign competitors are gaining more and more strength to maintain the struggle for the trade of the world in iron, and we may find ourselves by and by left to lament the folly which, by forcing up prices to an unnatural level, has effectually alienated a trade which we have always looked upon as our prescriptive right.

The late high prices of iron have brought with them the most exorbitant demands from colliery owners and workmen, who, learning their power, are now loth to meet the altered state of things by abating one jot from their extravagant pretentions. My object in troubling you with this letter is solely to issue a solumn note of warning to the coal owners and workmen as to the probable consequences of a persistence in their present policy. Engaged in the iron trade as a merchant, and with connections nearly all over the world, I am in a position to know exactly what is going on, and I can most solemnly assert my belief that a very few months more of the present high prices of iron will have a most disastrous effect upon the foreign demand for all future time.

The iron manufacturers are willing—nay, anxious—to reduce prices, but they can not afford to do so at the present prices of coal and labor. Are the coal owners prepared to sacrifice their best customers by demanding a price they cannot afford to pay? It is pretty well understood that the colliery proprietors are realizing fabulous profits at the present time, and, though I do not for a moment dispute their right to get the best price they can for their produce, I would yet beg them to consider whether their policy is wise, with a due regard to their own future interests.

In conclusion I will give you an extract from a letter received last week from some English friends in America, which will show you how the present state of affairs is viewed on that side of the Atlantic:

"We feel confident that the manufacturers and producers of the raw material on your side will before long be convinced of the actual necessity to bring down prices still more if they desire to retain any foreign trade. To do this there must be a determined and prompt action on all sides, for already too much time has been lost, at a sacrifice to English manufacturers which it would be impossible to estimate. All the mischief thus far caused must react on those who are responsible for it; viz., the workingmen, aided, doubtless, to some extent, by proprietors of coal and other mines, who are too grasping. We warn you that it will require a decided and hard push to get back anything like the business once enjoyed by England. The iron manufacturers in this country are a strong body, backed by men of large capital. Their opportunity has come, and they will not let it pass without a struggle, you may depend. So we say, use your every effort to bring prices down, and, by advice or otherwise, try to place before the makers on your side the facts of their true position, so that they may make an effort to retrieve the errors of the past before it is yet too late."

Trusting that you will lend the powerful aid of your pen to save the English iron trade before it is too late, I am, your obedient servant, A MERCHANT.

LIVERPOOL, Aug. 1.

The Iron Age.

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DAVID WILLIAMS . . . Publisher and Proprietor.
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The Coming Centennial Exposition.

If there be anything that is likely to interfere with the success of the industrial exposition which is to celebrate the centenary of American independence, it is the feeling which prevails among manufacturers and producers that the time to make ready for it is yet a long way off, and the disposition to postpone until the last moment the preparation of goods for exhibition or the subscription of money to aid the Commissioners in carrying out their plans on a scale proportionate to the importance of the enterprise, and worthy of this great, rich and enterprising young nation, destined to become the workshop of the world, in fact as well as in name, before another century shall have passed. In this busy, steam-driven age, when men's energies are taxed to meet the demands made upon them from day to day, and when capital finds so many avenues of profitable employment, it is, perhaps, natural that the labor of preparation for any great event of national interest, rather than of immediate individual profit, should be postponed as long as possible; but in this case it is a mistake to suppose that time enough remains in which to think about what is to be done for the Exposition. The time is short, and it is to be feared that the interval will slip away only to find us unprepared at last, and that we shall miss of failure only because of herculean efforts to hastily remedy the mischief resulting from procrastination. If so, the fault will not, from present appearances, be chargeable upon the Commissioners. They seem to be doing all they can with the resources at their command, but they lack the encouragement which would come from hearty assurances of a national support and co-operation, and if they, too, should delay the preparations until insufficient time remains in which to complete them, the people at large will be chiefly to blame. We have every assurance that they are doing all they can, and it only remains for the people of the country to take hold of the matter with an honest intention of assisting them to the fullest extent, to insure entire and complete success.

It is well known that the Exposition is to be made as truly international as possible. The countries of both hemispheres will be invited to contribute their products, and articles of interest will be gathered from every quarter of the globe. But the success of the Exposition will be measured, not by what comes to us from abroad, but what we can show of the varied productions of our own country—its industries, resources, and capacity for high and sustained material development. If not national in the broadest sense, it will be nothing; and when we think of the work yet to be done, and of the comparatively short time that remains in which to do it, we are startled at the seeming indifference manifested in States which, remote from the scene of the labors of the Commission, have caught nothing of the enthusiasm which already inspires the people of Pennsylvania. We do not believe that entire indifference as to the success of the enterprise is felt in any part of the country, but public sentiment on the subject has not yet been quickened into active sympathy with the movement. Local interests absorb attention, local annual exhibitions monopolize the sympathies of the classes which must furnish exhibitors, and not until the question of the success or failure of the National Centennial Exhibition is presented to the public as one which demands immediate answer, are they likely to bestir themselves. The consequences, we fear, will be that the exhibition will open incomplete and unsatisfactory, that early visitors will be disappointed, and that its close will find work still unfinished which should have been wholly preparatory.

In writing this we have no wish to discourage those to whom Congress and the people have committed the management of the enterprise. The movement is in good hands, and we wish it every success, for our national pride is involved in the still uncertain issue. But we believe the public impression that time enough yet remains in which to get ready for the world's critical inspection is a mischievous error, and in speaking as we do, our only desire is to assist the Commissioners in stimulating the public to more hearty and active co-operation with them in their arduous and thankless labors. A circular letter, printed in another column, invites intending exhibitors to send to the office of the Commissioners, in Philadelphia, their applications for the least amount of space they are likely to want, that the Board may form some idea of the amount of room needed to accommodate American exhibits. We hope this reasonable request will be promptly complied with, and that manufactures in all branches of industry, especially those represented by *The Iron Age*, will respond to the letter of the board without delay. It will secure them space and place them in communication with the board, so that letters of instruction and advice can be sent them as soon as issued. We have no time to lose, and shall gain nothing by delay in finding out exactly what we are going to do.

System in the Workshop.

What book keeping is to general business, system is to any branch of manufacture, and by this is meant not merely the orderly coming and going of workmen at the sound of the whistle, nor even the literal and well-defined usage of having a place for everything and everything in its place. Every shop must have its own particular method gauged according to its size, the character of its products, the relative skill of its operatives, and many other conditions peculiar to itself. It is a practice, and a paying one, in many large machine works, to have the tools, files, drills, vise heads, cold chisels, etc., kept in a separate room, under the charge of a special clerk, and each implement carefully charged to the workman using it. On the other hand, there are thousands of small workshops where one, two or three mechanics make a fair livelihood by ten hours of industrious labor per day, in which the truest economy is found in each man's ability to make and repair his own tools without assistance from his associates. What is necessary system in the one case would be an absurdity in the other, but it is safe to say that these are general rules which apply alike to both, and the observance or non-observance of which, in either case, make precisely the difference between success and failure.

One of the most common sources of inconvenience, and consequently, in time, of material loss, is found in the bad arrangement of different parts of a shop with reference to each other, and in the cumbered conditions of the floors. We can recall one establishment, a foundry and machine shop, where the castings had to be carried from the sand to the vitriol room through a narrow passage and over a large beam; thence back over the same beam, through the same passage, and over the raised step of the machine shop door, before they came within forty feet of the planer or twenty of the engine lathe. In the machine shop the windows were so high that the vise close to the wall had but an insufficient light, and at intervals the posts, supporting a roof that should have supported itself, furnished resting places for castings not wanted, but at all times in the way. No man was more earnest in business, more honorable in his dealings or more careful in outlay than the proprietor, yet he saw a heavy percentage of the room rendered worse than useless, his best workman limping at one time for a space of three months with an ankle bruised on the stumbling blocks left in the way, and, because of this neglect long continued, the close of a laborious and honored life beheld the property pass into a stranger's hands. Convenient passages from one room to another, smooth tramways for hand-cart or barrow, pulley blocks handy where lifting is needed, and no rubbish where men's hands must work or their feet tread, are essential features of a system which, if observed, would have added ten years to many a manufacturer's life, or saved to him rooftree and garden when weary and old.

But while method and system should ever be observed in fitting up a workshop, whatever the industry to be carried on within it, intelligence and judgment should guide the manufacturer in planning its construction. He should consider carefully the best methods of combining strength with economy of material, select that material which, other things being equal, will cost the least, and work up, so far as possible, the refuse to some good purpose. This sounds, of course, like the simplest commonplace, but in at least five out of ten miscellaneous workshops these common sense rules are habitually disregarded, and this holds true in most of those small establishment that can afford it the least. Very frequently their observance, combined with a little business tact and energy, has resulted in the creation of entirely new branches of productiveness, as in the substitution, in the manufacture of iron fence, of gas pipe for solid rods, or in the fabrication of tin foil, of a sheet of lead between two layers of tin, in place of block tin only.

It is to be taken for granted that steam or water power will move the machinery of any successful shop, and in this item economy is most frequently the result, not of "Poor Richard" maxims literally observed, but of judicious and, judged by the common standard, liberal expenditure. No other thing on earth void of reason and instinct has so great a capacity of revenge for neglect or careless usage as a steam engine, and nothing will waste more than a poor water wheel. As concerns the latter, the old time overshot and breast wheels have outlived their usefulness, as appears from their displacement, in some of the largest New England mills, by costly turbines. Among the many new wheels, each proclaimed the best, it is difficult to select; but any engineering text book will give the theoretic value of a given volume of water flowing under a given head, and almost any responsible manufacturer will warrant his wheels. It is well to purchase on the warrantee of a fair approach to the theoretic power of the fall, but the buyer should be certain before paying, to have the test made with a dynanometer upon the shaft, and more than once, with the gate raised to different hights, to make the stream approximate the variations of its summer and autumn flow. As to the steam engine, its management should be perfectly systematic, and no man should be entrusted with its care who does not understand his work and take an interest in every detail of it, neglecting nothing. It is said that the keen observer can estimate the character of a man by the appearance of his dog; it is certain that the dullest can judge, without mistake, of the prosperity of a workshop by the condition of its engine.

Perhaps the item in which method brings the largest returns is that of keeping machinery in constant use. Not only by this means is its usual profit obtained, and the interest on its first cost saved, but the mechanism, if kept in good repair, will last much longer; for it is well known that when in daily operation, a machine like an engine lathe will deteriorate but one-half as fast as when entirely idle. This should be kept in mind when selecting for manufacture a line of staple articles; that which will keep the machinery running regular throughout the year, other things being equal, pays a better interest on time, money and labor, than that which, for any cause, must be allowed to stand idle at intervals.

In presenting these suggestions for the consideration of manufacturers, we have advanced no new or original thoughts, but such advice, though often given, is less often heeded than it should be by those to whom it is addressed. That system and method is one of the prime conditions of success in manufacturing, all thoughtful persons will admit; in what system consists and what methods most conduce to economy and prosperity, we cannot attempt to define within the brief limits of a newspaper article. Indeed, no rules which might be laid down, however carefully devised, would admit of universal application. The manufacturer must in every instance consider the situation from his own standpoint. He must exercise common sense at the outset, in planning his workshop and directing the operations to be carried on within it, and then profit by his experiences to improve his facilities, guard against the repetition of mistakes, elevate the standard of skill among his workmen, and make his product at once as excellent and cheap as possible. Nothing is "good enough," so long as it is susceptible of improvement. How often do we see manufacturers, starting with small means, gradually extend their establishments, increase their capital and create new markets for their goods, until they attain honorable wealth and distinction, and more than national reputations? How often, on the other hand, do we see companies starting with large capital and every prospect of success, gradually go down into obscurity, and perhaps bankruptcy? What is the reason of success in the one case and failure in the other? Something which it would be impossible to exactly define, perhaps, but there is a reason for everything, and one which in such cases may be found, if sought. A manufacturer does not need long experience to show him which way he is tending—whether toward success or failure. If toward success, it is at once his duty and his pleasure to study the means by which he has achieved what he has already accomplished, and improve them to the fullest extent. If toward failure, it is still more his duty to examine into the causes for his failure, and see that they are promptly and effectively remedied. This is not merely a question of greater individual gains to the manufacturer, however desirable may be financial prosperity; it is a question of moral duty and social obligation. No man has a right to make a failure in life from any cause. Some measure of success is possible to all who will honestly strive to attain to the highest position within his reach, and the man who fails from causes which forethought and prudence would have guarded against, sins against God and man. Energy and perseverance will accomplish something, but to accomplish much they must be intelligently directed to the attainment of well defined and desirable results. Power, whether of mind, or muscle, or machinery, must be systematically and methodically employed if it is to do good and not mischief, and nowhere are system and method so indispensably necessary as in directing the power employed in production. These are but random suggestions, hastily penned, but they may furnish food for profitable thought, especially to those who, laboring against difficulties and discouragements to build up manufacturing industries, have yet to learn that industry and enterprise are not the only conditions of success, and that, without system and method, they often hasten failure, or render success the more difficult of attainment.

A Proposed National School of Mines.

We are informed that a movement is on foot looking to the establishment of a National School of Mining and Metallurgy under the patronage of the federal government, at which young men, appointed by a board of examiners before whom any one may appear who shall file applications at the proper times and under prescribed conditions, can enjoy opportunities of acquiring a thorough theoretical and practical knowledge of mining and metallurgy needed to make them, with subsequent practice of their profession, accomplished mining engineers. Considered in the abstract, the idea is a good one, for we need an institution which shall be, in the true sense of the term, a national school of metallurgy and mining engineering. Under the present system, metallurgical education is, to a very great extent, limited to the class of young men likely to make the least practical use of it in after life. The sons of gentlemen of means, who choose mining engineering as a profession, do not, as the rule, follow that profession when they have learned it. It is laborious, and requires too many sacrifices which they are unwilling to make. In many instances they find business opportunities open to them in which they have but little, if any, opportunity to employ their knowledge of metallurgy and mining. Only a small percentage are willing to relinquish the luxuries and refinements of civilization to engage practically in mining operations where their knowledge would be most valuable; and, with all our technical schools, there is a growing scarcity of young men able and willing to assume the management of mining operations.

It does not follow, however, that the government need undertake the work of educating young men to this profession at the expense of the national treasury. Private enterprise and liberality are equal to any demands which may be made upon it in this direction, and when the necessity for increased facilities for technical education is fully appreciated, our men of wealth and culture will be prompted by a generous and large-hearted liberality in founding and endowing such institutions. We have already several good schools of mines, but we need more, especially in the West, at which boys brought up among mining and metal working industries can be educated at a cost within the means of parents whose incomes do not admit of sending their sons to colleges in the East, where board and tuition are costly. The class most likely to profit by technical education, and to make good use of it in after life, comprises the sons of intelligent miners and mechanics, who look forward to dependence solely upon their own exertion, and who are inspired by a high and worthy ambition to excel and attain, if possible, both wealth and reputation in the occupations to which they devote themselves. So far as we know, there is not more than one, or at most two, good technical schools in the West, and as the capacity of an institution of this character is, of necessity, limited, they are enabled to graduate but few students annually, after the classes are thinned out by the withdrawal of those who are unable to complete the courses. The consequence is, as we have said, that but a small number of young men become mining engineers, and as but few of these follow the profession, it is certainly not to be wondered at that the demand for trained talent in this profession should in in excess of the supply of it. This would, perhaps, seem to justify the establishment of a national school of mines, but we see no necessity for government interference in the matter. Such a movement would be a step in the wrong direction, and would but prepare the way for the assumption by Congress of the extra constitutional power of nationalizing our educational system, and giving it into the hands of a bureau and a Congressional committee. Such interference on the part of the national government is neither necessary nor desirable. Our educational system may be susceptible of improvement in some respects, but it is doubtful if Congress has the power or disposition to correct its defects or to provide any better facilities than are now offered for the free education of the masses. So far as technical education is concerned, the want of more schools in parts of the country not now supplied, is an evil which time will correct. If left to private enterprise and liberality, we shall have a gradual increase in the number of such schools, until the existing want is fully supplied. Our men of wealth are beginning to understand that money cannot be better dispensed for the good of society than in providing educational facilities for poor young men of talent, and the few conspicuous examples of large benevolence which are ever before us in successful technical colleges, founded and maintained by private individuals, cannot fail to inspire our men of wealth with a desire to perpetuate their memories by similar means. If, on the other hand, Congress undertakes the work of providing educational facilities, private individuals will refrain from taking any part in the matter. No one cares to compete in matters of this kind with the resources of the national treasury, and a National School of Mines, however good, would not meet the existing want half so well as it will be met if left to the people. Much has been accomplished already toward the establishment of an American system of technical education worthy of this great country and its resources, and until we see evidence of a change in the sentiments of those to whom we look for aid in increasing the number and facilities of our technical schools, Congress need not take upon itself any responsibility in the matter.

Railway Enterprise in Mexico.

Advices from Mexico report that the contract made by the Mexican government with the agent of the International Railway Company will probably receive the entire approval of the legislative branch at the reassembling of Congress. The enterprise projected by the company is the most important ever proposed in Mexico, and should it be carried into effect, would do much to develop the internal resources of that country, and to stimulate its commerce, especially with the United States. The road as projected, and which is already built as far as the City of Mexico, a distance of 260 miles, will give Mexico a trunk line from which will grow, in time, an extensive and far reaching system of branch lines, tapping the richest and most productive sections of the country, and bringing them into close connection with the railway system of the United States. The distance from Vera Cruz to San Blas on the Pacific by the proposed line is 873 miles; from the City of Mexico by way of Lagos to Larido, the point of union with the Texas International, 896 miles; from Laredo to San Blas,

992 miles, and from Laredo to Vera Cruz, 879 miles. The terms of the contract provide that the road is to be built with the standard American gauge of 4 feet 8½ inches, and to penetrate by the best and most practicable routes those portions of Mexico which possesses the largest and most varied resources. The advantage, commercially, of this line to the United States, is found in the fact that it will bring this city within 2850 miles of the City of Mexico, and St. Louis within 1894 miles of it, by a line of direct railway communication, beside rendering the port of San Blas as accessible as is San Francisco at the present time, or as San Diego and Puget Sound will be upon the completion of the Texas and the Northern Pacific railways.

As to the ability of the company to carry out their scheme, it may be said that their financial resources would appear to be adequate to the undertaking. The capital is fixed at $50,000,000, which it will not be difficult to raise if the charter granted by the government is approved by the Congress without modification. The company are to receive, in the nature of a bonus or premium from the Mexican government, $100,000, if the road is finished in nine years; $400,000, if in eight; $900,000, if in seven; and $1,600,000, if in six years: Also $13,500 per mile, for which the government is to issue bonds, payable from customs receipts, and a right of way of about 224 feet in width. The company is pledged, in a forfeiture of $400,000, to complete and operate the road according to the terms of the contract. The total distance to be built is 1629 miles, including branches to Durango from Lagos, Moreta from Salamanca, and Guanajuato from Silao. It is a bold project, no more so, however, than those which have been carried successfully in Peru and other South American States, and should it be undertaken, as now seems probable, it will, beside opening a new and important market for American rails, machinery, tools and ironware, do much to civilize Mexico, to stimulate her production of useful and valuable commodities, to allay political strife and partisan dissension in that hitherto unhappy country, and, perhaps, to pave the way toward the establishment of closer and more intimate relations with this country, commercial and political, than now exist.

Honors to a Mechanic's Memory.

Had those who doubt the dignity of labor, witnessed the burial of the late George Fritz, of Johnstown, Pa., a short time ago, they would have learned that a mechanic may often merit and receive public honors greater and more sincere than those paid to statesmen and military heroes. Mr. Fritz had never held political office, never won military renown, and only achieved a fame which, if not local, was certainly limited to the iron trade of the country. He was not wealthy and was not great in anything save in mechanical skill, uprightness and force of character. A working man in the truest sense, a mechanic in the strictest interpretation of the name, he was followed to his grave by sorrowing thousands, amid every demonstration of public sorrow which could have been shown for the greatest soldier or statesman in the land. What claim had this plain, hard-working man upon the sympathy and affection of the people among whom he lived? Merely this: he was a great mechanic and a man of sterling worth. Nothing more, but that was enough to give him a foremost place in the community in which he lived. Nor was the tribute to his memory undeserved. He had rendered the world important services during his short but busy life, and his works survive him. His contributions to the progress of iron manufacture were many and important, his improvements in labor saving machinery and appliances a blessing to the working man. He brought to his trade a high and well developed talent, and made himself name and position because of the qualities of mind and heart which men bow to and admire. It were an easy and pleasant task to point the moral of such a life, but it is so evident that he who runs may read. There is one class, however, for whom the story of Geo. Fritz possesses a peculiar interest—the young men who, turning away from honest and manly toil as something for those beneath them to perform, seek the success which they fondly believe to be easy of attainment in employments already overcrowded, and in which the results of life long labor often hinge upon the turn of a die. If they would only realize that the broad field of mechanics offers unequaled chances of success to those who seek them aright; that mechanical skill, with or without talent, is a capital of which no reverses could deprive them; that labor is dignified and honorable, and that the mechanic with brains and knowledge can stand before kings and receive an homage never paid to mere royalty, there would be less mourning over wasted lives, lost opportunities and disappointed ambition.

Scientific and Technical Notes.

The *Revue d'Artillerie* gives an account of a recent trial of

THE HOTCHKISS REVOLVER CANNON,

from which we take the following: The new cannon has a calibre of four centimetres, and is essentially different from all other mitrailleuses presented up to this time, especially in firing a small cast iron shell with a percussion fuse, the effect of which must be terrible at long ranges. The ammunition is an explosive projectile attached to an iron cartridge; the cartridge case is made from a tinned iron tube soldered, with one end turned down to form a cup. This cup, or tube is reinforced in the interior by two iron cups, and fixed with three rivets on a large iron washer of sheet iron, which forms the head, and is designed to withstand the pressure of the gases, and to give hold to the extractor. The priming is fixed in the center of this head. The cartridge shell will hold 100 grains of powder. A thick felt wad is put between the powder and the projectile. In the cartridges fired at Satory the powder charge was reduced to 80 grammes of Austrian powder, and the space left was filled up with two washers of ordinary paper placed on the powder and covered with a little cotton. The projectiles have a length of 2½ calibres, and a portion of their length is covered with brass, having cuts designed to be forced into the rifling. Its weight is 500 grammes, and it holds 40 grammes of powder. The cartridge, loaded complete and primed, has a weight of 800 grammes. The projectile does not seem to be fastened tight enough in the cartridge case, as it can be taken out with a little effort with the hand, and it is feared that in the transportation of them in boxes the projectiles might separate from the cartridge shells. To avoid all chance of accidents, the cannon revolver was placed in battery about 100 metres from the target, the projectiles being loaded and having their percussion fuses. Forty shots were fired at the commencement of the trial. Cartridges fired and extracted from the cannon did not drop out of the extractor regularly. This slight defect was remedied on the spot in a few minutes. After this no difficulties or irregularities in the firing occurred. The cartridges were oiled previous to firing. The cartridge shells did not show any damage by firing, and can be reloaded and fired several times. One was found unsoldered but was not broken, and acted perfectly as a gas check, as it could, like the others, be used again by being resoldered, which can be done without difficulty. Only one missfire occurred, and the same cartride was fired on the third trial after missing twice. There was also only one missfire with fuses. Generally the projectiles passed through the board target and exploded on striking the ground. Only one projectile was exploded by striking the board of the target. One projectile broke in the barrel of the cannon, but this accident should not be attributed to the irregular working of the fuses, because the projectiles proved to have been badly cast. They were left very weak by the hole being badly one-sided. Six shots were successfully fired in twelve seconds by loading the cartridges one at a time. Then fifteen shots were fired in fifteen seconds by loading with cases, in which a certain number of cartridges had been placed previously. The firing could be kept up for a certain length of time at the rate of sixty shots per minute, which gives thirty kilos—seventy pounds English—of cast iron fired in this time. The firing is very regular, and the sighting did not seem to vary to any noticeable extent; the projectiles exploded into twelve or fifteen pieces, large enough to kill at a certain distance from the exploding point. The butt piece does not generally break, although breaking lines have been prepared on it. One inconvenience was the rapid brassing of the barrels which took place during the trial; it appeared at the first shots and increased rapidly. It is to be attributed, no doubt, to the bad quality of the brass from which the covering of the projectiles has been made. Generally the mechanism of the Hotchkiss revolving cannon seems to work surely and regularly, and the ammunition will do good service if the projectiles are more firmly attached to the cartridge. The projectiles are difficult and delicate to make, and must necessarily be expensive. This cannon will, without any doubt, produce terrible effects at distances approaching those of field artillery, and the explosive qualities of its projectiles assure it a superiority over all other mitrailleuses, as its fire can be rectified by observing the explosions of falling projectiles.

L. Gruner, in *Annales des Mines*, gives the following

NOTES ON BLAST FURNACE CONSTRUCTION AND MANAGEMENT,

which will be found interesting: 1st. The production of large blast furnaces, whose contents exceed 200 cubic meters, does not increase proportionally to their capacities. 2d. In order to estimate the working of furnaces it is necessary to determine experimentally the proportion $CO : CO_2$ in the tunnel-head gases; by means of this proportion it is not only possible to calculate the true composition of the gas, but also the quantity of air demanded by the furnace. 3d. In order to determine the proportion $CO : CO_2$ it is not sufficient to take a number of samples instantaneously, but the gases must be withdrawn for several hours. 4th. When the composition of the gas is once determined, it is necessary, in order to keep an exact account of the working of the furnace, to ascertain the balance between the heat received and that expended, and to estimate separately the heat evolved in the zone of the tuyeres and that produced in the reducing zone. 5th. On applying these principles to some of the Cleveland blast furnaces, it is possible to prove that the advantages of high furnaces over low ones simply result from the lower temperature of the upper portions of the shaft. The reduction takes place in a more complete manner by the sole action of carbonic oxide, without the intervention of solid carbon; thus approaching the ideal working of a furnace, which supposes the solid carbon to be exclusively burnt by the oxygen of the blast. A subordinate advantage is the less amount of sensible heat possessed by the gases at the furnace top. 6th. The consumption of fuel in blast furnaces is partly dependent on their production. A minimum consumption corresponds to the average working, which varies with the hight and absolute capacity of the furnaces. 7th. In consequence of the decomposition of carbonic oxide in the upper portions of blast furnaces, the temperature of the tunnel-head gases cannot be lowered beyond a certain limit; therefore, when this limit is attained, there is no advantage in increasing the volume and hight of furnaces. Too slow a working and an excessive volume may become burdensome. 8th. The heat supplied by the hot blast may advantageously replace that produced by combustion in the tuyere zone. The economy due to the hot-blast diminishes relatively as the temperature is advantageously elevated. In practice the actual economy is small above 700°–800° C. The hot-blast tends to increase the value of the proportion $CO_2 : CO$; and, in consequence of the cooling of the upper portions of the blast furnace, promotes the reduction without consumption of solid carbon, *i. e.*, the ideal working of the furnace.

Mr. G. Armes, of Rochester, N. Y., proposes a novelty in

SURFACE HARDENING STEEL,

which consists in subjecting the surface of the steel to be hardened, while in motion, to the action of a surface in contact moving at a very high velocity. If, for example, it be desired to harden the surface of a cylinder made of steel, the cylinder is mounted in a lathe turning at the slow motion usually given for turning such a body in the usual engine lathe. To this is applied an emery wheel rotating at a velocity of about 1800 revolutions per minute. The periphery of the emery wheel is kept in contact with the surface of the cylinder, which, in addition to its slow rotary motion, has a traversing motion of a little less than an inch to each revolution. At the end of this operation the entire surface of the cylinder will be hardened to a depth of about 1-32 in., and so hard that it will resist the action of the best tools made of cast steel and hardened in the usual way. Better results, it is stated, can be obtained when the emery wheel can be run at a higher velocity than that above given; and cast iron wheels with smooth faces, or hard substances, may be employed in lieu of emery wheels. For hardening flat surfaces, the piece of steel should be mounted in a caariage, so that it can be moved forward, in order to present in succession every part of the surface to contact with the periphery of the wheel; or the same result can be produced by mounting the wheel in a carriage having the required traversing motions. Or if the surface to be hardened be of greater width than the face of the wheel, the block steel may be mounted on a carriage having one motion, and the wheel also mounted in a carriage having a motion at right angles to the motion of the block-carriage. If the surface to be hardened be of any form than a cylinder or flat surface, the form of the periphery of the wheel or the motions to be given, other than the rotatory hardening motion, must be such as to present in succession every part of the surface to the action of the wheel. The process can obviously be applied to the hardening of the surface of any article made wholly or in part of steel, unless the surface be so irregular that the required motion for contact and action cannot be attained or effected.

Les Mondes speaks of a

REMARKABLE METALLURGICAL PROCESS

lately conducted by M. Deville as follows: It is known that the International Metric Commission, which met in Paris in October last, decided that each of the countries represented should be supplied with a standard meter made from iridiated platinum, and that the manufacture of all the bars should take place at the same time, and at one melting of the alloy. Before proceeding with this delicate and extensive operation, the French section of the Commission, to which the work was intrusted, caused to be made two type meters, in order to test the processes to be employed in forming the standards. M. Deville having succeeded in obtaining iridiated platinum in a perfectly pure state, the fusion and casting of the types were recently consummated in his laboratory. Nineteen and four-fifths pounds of platinum were, by the action of the oxy-hydrogen flame, melted in 45 minutes, with 2 2-10 pounds of iridium. The latter is by far the least fusible and hardest of metals which accompany platinum in its natural state. The ingot was cast in a mold formed from a block of carbonate of lime, the interior surface of which was brought to the state of caustic lime under the excessive temperature developed therein. By this means all risk of fissures within was avoided. The metal cooled in the mold, retaining its brilliant surface, after which the bar was suitably rolled and finished. The operation, which was a complete success, is to be repeated with the 440 pounds of alloy necessary to compose all the standards—a metallurgical process far exceeding in magnitude any of a similar nature that has yet been attempted with these metals.

Mr. Dormoy, of Troyes, has invented an

IMPROVEMENT IN PUDDLING FURNACES,

which consists in providing them with a preparing or heating chamber, combined with the ordinary puddling chamber, the two being separated by a high bridge. In the preparing chamber the pig iron is heated to incipient fusion by the waste heat or gases passing from the puddling chamber, the heated pig iron being charged into the puddling chamber by lifting it over the bridge between the two chambers. By means of a moveable regulator or reverberator situated at the contracted end or neck of each of the chambers described, and working in a transverse opening in the arch of the furnace, the space at the contracted end or neck of each chamber may be diminished or increased at pleasure, so as to regulate or control the combustion of the gases or flames passing through the chambers, as well as the temperature of the chambers. Air may be admitted into the chambers through the reverberators, and they may be kept cool by water or steam passed through them. The bridge between the two chambers is hollow, and is kept cool by a current of water, a thin layer of refractory material covering it. The improvements are also applicable to heating and other reverberatory furnaces.

Rates of Duty on Pig and Bar Iron from the Earliest Tariff Act to the Present Time.

By the first tariff Act, approved July 4, 1789, and taking effect August 1, 1789, a duty of 7½ per cent. *ad valorem* was laid "upon all castings of iron, and upon slit and rolled iron"—no other forms of iron being named—and "on all other goods," at this time undoubtedly including pig and bar iron, the rate was 5 per cent., the duty in all cases being "on the value at the place and time of importation." The nearest quoted prices (N. Y., Sept., 1791) are £9 to £10 for pig, £29 to £30 for bar, and £36 for nail rods, making the actual duty (7½ per cent. on £36) $13 per ton on slit and rolled, $7·25 per ton on hammered bar, and $2·28 per ton on pig.* But on all these, as well as other rates of duty, "a discount of 10 per cent." was allowed on all importations in United States vessels.

An Act approved August 10, 1790, taking effect January 1, 1791, increased duties generally, and changed the duties on iron by providing that "an addition of 10 per cent. should be made to the existing rates on merchandise imported in vessels not of the United States," no discount being admitted on merchandise in American vessels.

An Act approved May 2, 1792, and taking effect July 1, 1792, first names "generally all manufactures of iron," in connection with "all cast, slit, and rolled iron," as paying 10 per cent. duty, the 10 per cent. discrimination against foreign vessels being retained. Credits on these duties were allowed, one-half at 6 months, one-fourth at 9 months, and one-fourth at 12 months from the time of importation. Probably pig and hammered bar were included in the terms above cited, as "manufactures of iron."

An Act of June 7, 1794, taking effect July 1, 1794, imposed 5 per cent. additional duty "on cast, slit, and rolled iron, and generally on all manufactures of iron," thus raising the former rates to 15 per cent. in American, and 16⅔ per cent. in foreign vessels, the basis for valuation still being the "value at the time and place of importation." But an Act of January 29, 1795, taking effect April 1, 1795, changed this basis to "the actual cost at the port of exportation, including all charges." This important change reduced the duty nearly one-half, the foreign values being not above £4 to £5 for pig, £12 to £15 for bar, and £25 to £30 for slit and rolled.

An Act of March 26, 1804, taking effect July 1, 1804, added 2½ per cent. to all duties, as a special levy to constitute the "Mediterranean Fund." This Act continued in force till March 3, 1815. Iron, therefore, paid 17½ and 19¼ per cent. in American and foreign vessels respectively, the discrimination being retained. An Act of March 27, 1804, advanced, from July 1, 1804, the duty on "slit and hoop iron" to 1 cent per pound, no other form being named.

An Act of July 1, 1812, taking effect immediately, added 100 per cent. to all permanent duties (not including the 2½ per cent. of the Mediterranean Fund), retaining also the discrimination against foreign vessels. The rates were, therefore, 32½ per cent. in American vessels, and 37 4-10 per cent. in foreign vessels.

The construction of these early acts by the Comptroller's office of the Treasury, as appears by official schedules printed at the time of each act, is as follows, the singular omission to name pig or hammered bar in any of these schedules being borne in mind:

RATES OF DUTY FROM 1789 TO 1816.

Act of	Taking effect	Duty on Pig & Bar.	On all Iron, Pig, Bar, Slit and Rolled.	
			In American vessels.	In Foreign vessels.
July 4, 1789	Aug. 1, 1789	7½ per cent. on H. V.	11 per cent. on home value.	
Aug. 5, 1790	Jan. 1, 1791	5 per cent. on H. V.	16⅔ per cent. on home value.	
May 2, 1792	July 1, 1792	10 per cent. on H. V.	16⅔ per cent. on home value.	
June 7, 1794	July 1, 1794	15 per cent. on H. V.	16⅔ per cent. on home value.	
Jan. 25, 1795	April 1, 1795	15 per cent. on H. V.	16⅔ per cent. on foreign value.	
Mar. 27, 1804	July 1, 1804	17½ per cent. on H. V.	19¼ per cent. on foreign value.	
June 30, 1812	July 1, 1812	32½ per cent. on H. V.	37·4 per cent. on foreign value.	
April 27, 1816	July 1, 1816	20 per ct. on foreign value, plus 10 p. c.	22 per cent. on foreign value, plus 10 p. c.	

An Act of March 27, 1804, put a duty of 1 cent per pound on "slit and hoop" iron; the Act of June 30, 1812, therefore, doubled this duty, making it 2 cents per pound in American vessels, and 2·31-100 cents per pound in foreign vessels. But the foreign value, as before determined, was hereafter to be increased by adding 10 per cent. to all invoices.

An Act of Feb. 5, 1816, added 42 per cent. to all existing duties, from July 1, 1816, but it never took effect. The Act of April 27, 1816, taking effect July 1, 1816, superseded it, and made many duties specific; also reducing the duty to 20 per cent. on "manufactures of iron," under which head, apparently, pig iron continued to be placed. From this time the duties were specific on bar and rolled iron of all forms, and by the Act of April 20, 1818, pig iron was first named, and put at the specific duty of 50 cents per cwt.

The Act of April 27, 1816, from July 1, 1816, puts on iron in bars and bolts, except iron manufactured by rolling, a duty of 45 cents per cwt.; "on iron in bars and bolts, manufactured by rolling," $1·50 per cwt.; iron in sheets, rods and hoops, to pay $2·50 per cwt. The discriminating addition of 10 per cent. on foreign vessels continued.

The Act of April 20, 1818, taking effect July 1, 1818, increased the duty on iron in all forms, naming pig iron at 50 cents per cwt., or $10 per ton; and from this time forward the duties were specific up to 1846. The 10 per cent. addition in foreign vessels did not apply to British iron after 1816, because of the treaty of July 3, 1815, and, therefore, practically ceased to be an element of the duty, though continued on vessels of other nations generally about to 1827. The following are the comparisons for this period, from 1816 to the Compromise Act of 1833:

RATES OF DUTY FROM 1816 TO 1842.

Act of	Taking effect.	Duty on Pig per cwt.	Duty on Hamm'd Bar per cwt.	Duty on Rolled Bar per cwt.	Duty on Rod, Slit and Sheet per cwt.
April 27, 1816	July 1, 1816	(20 p. c. ad val.)	45 cents.	$1·50	$2·50
April 20, 1818	July 1, 1818	50 cents.	75 cents.	1·50	2·50
May 22, 1824	July 1, 1824	50 cents.	90 cents.	1·50	3·36 (a)
May 19, 1828	Sept. 1, 1828	62½ cents.	$1·12 (b)	1·87½ (c)	3·92 (d)
July 14, 1832	March 3, 1833	50 cents.	90 cents.	1·50 (e)	3·36 (a)
March 2, 1833	July 1, 1834	Abates one-tenth of excess over 20 per cent.			
March 2, 1833	Jan. 1, 1836	Abates two-tenths of excess over 20 per cent.			
March 2, 1833	Jan. 1, 1838	Abates three-tenths of excess over 20 per cent.			
March 2, 1833	Jan. 1, 1840	Abates four-tenths of excess over 20 per cent.			
March 2, 1833	Jan. 1, 1842	Abates seven-tenths of excess over 20 per cent.			
March 2, 1833	July 1, 1842	Abates all above 20 per cent. ad valorem.			

(a) 3 cents per pound; (b) 1 cent per pound; (c) $37 per ton; (d) 3½ cents per pound; (e) $30 per ton.

This schedule of reductions in the Compromise Tariff act is simply put in the language of that act; the abatements being made by taking off one-tenth, or more, as the case may be, from the difference between the sum the duties would amount to at 20 per cent. and the sum as calculated by the rates in force: *e. g.* a duty of $50 per ton on iron costing £30 per ton, and which would pay $28·80 per ton at 20 per cent., would be reduced by one-tenth of the difference (1-10 of $21·20) or $2·12 per ton; making it $47·88 per ton at the first reduction.

The precise effect of these successive reductions cannot be given, so much depended on contemporary regulations and constructions in executing a complicated provision of law. The basis of valuation, as provided by the Act of July 14, 1832, was the foreign market value, with all costs and charges added. The reduction in duty was not large, previous to 1838, but at last it became but about one-third to one-fourth of the rate paid in 1833 on iron in these forms. Thus, the duty of 20 per cent. would have been, on pig iron, not over $4 per ton, on bar, $10 or $12 per ton, and on slit, rod and hoop, not over $20 to $25 per ton. These are but about one-third the rates prevailing from 1824 to Jan. 1, 1834.

The Act of August 30, 1842, taking effect immediately, advanced the rates from 20 per cent. *ad valorem* to $9 per ton for pig, $17 for hammered bar, and $25 per ton for rolled bar. Band, sheet, slit, and rolled iron was 2½ cents per pound, and this rate continued until the *ad valorem* tariff of July 30, 1846, took effect, making, from December 1, 1846, all forms of iron 30 per cent. *ad valorem*. This was but about two-thirds of the duties previously imposed.

The Act of March 3, 1857, taking effect July 1, 1857, reduced all these rates to 24 per cent., the dutiable value remaining the same, or being the foreign market value, with cost of putting on shipboard added. Under this Act the duty was half, or less than half, that of the tariff of 1842.

The Act of March 2, 1861, taking effect April 1, 1861, made the duty on pig iron, $6 per ton, and on both forms of bar, $15 per ton, if of ordinary sizes; on extra sizes of bar, and on band, hoop, slit, and sheet, $20 per ton.

The Act of July 14, 1862, taking effect Aug. 1, 1862, increased the duty on bar of ordinary sizes from $15 to $17 and $18 per ton, and extra sizes $5, or to $25 per ton.

The Act of April 29, 1864, added 50 per cent. to these rates to July 1, 1864, when the Act of June 30, 1864, took effect, making pig $9 per ton; ordinary bar, $22·40, and extra sizes, $33·60 per ton. Band, hoop and scroll was 1¼ cents to 1¾ cents per pound.

The Act of July 14, 1870, reduced pig iron to $7 per ton from Dec. 1, 1870, but did not affect bar iron.

Finally, the Act of June 6, 1872, taking effect Aug. 1, 1872, took off 10 per cent. of all these duties, reducing the amount on pig iron to $6·30 per ton, ordinary bar to $20·16, and extra sizes of bar to $30·24 per ton, at which rates they remain.

The following is a general table since 1842:

RATES OF DUTY FROM 1842 TO 1872.

Act of	Taking effect	Duty on pig.	Hammered bar.		Rolled bar.		Rod, slit, hoop & sheet.
			Ordinary size.	Extra size.	Ordinary size.	Extra size.	
Aug. 1, 1842	Aug. 1, 1842	$9·00 per ton.	$17·00 per ton.		$25·00 per ton.		$56·00 per ton.
July 30, 1846	Dec. 1, 1846	30 per cent.	30 per cent.		30 per cent.		30 per cent.
March 2, 1857	July 1, 1857	24 per cent.	24 per cent.		24 per cent.		24 per cent.
March 2, 1861	April 1, 1861	$6·00 per ton.	$15·00 per ton.		$20·00 per ton.		$25·20 to $35·28 per ton.
July 14, 1862	Aug. 1, 1862	$6·00 per ton.	$17·00 per ton.		$25·00 per ton.		$30·24 per ton.
April 29, 1864	April 30, 1864	$9·00 per ton.	$25·50 and $27 per ton.		$37·50 per ton.		$39·30 per ton.
June 30, 1864	July 1, 1864	$9·00 per ton.	$22·40 per ton.		$33·60 per ton.		$28·00 to $39·20 per ton.
July 14, 1870	Dec. 1, 1870	$7·00 per ton.	$22·40 per ton.		$33·60 per ton.		$28·00 to $39·20 per ton.
June 6, 1872	Aug. 1, 1872	$6·30 per ton.	$20·16 per ton.		$30·24 per ton.		$25·20 to $35·28 per ton.

The distinction between rolled and hammered bar ceased in 1861, and a new distinction between ordinary and extra sizes was introduced. Also, in 1862 to 1864, a distinction against bar costing over $50 per ton, was made, of $1 per ton; and again, in 1864, a distinction in band, hoop, sheet and scroll iron was made of 1¼, 1½ and 1¾ cents per pound for different sizes.—*Bulletin of the Iron and Steel Association.*

Application for Space in the Centennial Exposition.

The following circular has been issued to intending exhibitors at the Centennial Exposition:

U. S. CENTENNIAL COMMISSION,
No. 904 Walnut Street, Phila.

For the purpose of facilitating the progress of the necessary preparations in connection with the International Exhibition of 1876, your co-operation is requested. Have the kindness to forward a list of such products or manufactures as you desire to have on exhibition at that time, with amount of space required, so far as it is possible to prepare it. This list will not interfere with any future entries that you may desire to add, the object being simply to form some practical idea as to total amount of space required, and to aid in the prompt production of the catalogue. A form is inclosed, which you will please fill up and send addressed to Yours, respectfully,

ALFRED T. GOSHORN, Director General.

Applications have already been received from intending exhibitors for space to the amount of about 100,000 square feet. The city of Lyons, which sends the first application yet received from abroad, asks for 600 square feet for silk and manufactures or silk.

* There is a singular omission in this, and in all subsequent tariff acts to that of April 20, 1818, to name pig iron or hammered bar at all. In no Act, schedule of duties, or statement of imports, is pig iron once named or alluded to in all this period. Nor is hammered bar iron once enumerated or referred to for the same period.

Trade Report.

Office of THE IRON AGE,
WEDNESDAY EVENING, Aug. 27, 1873.

The events of the past week in the various financial centers are of somewhat greater general interest than those we have lately been called upon to report. There has been a stiffening in the money market, premonitory of approaching stringency later in the season, and call loans advanced to 4 @ 5 per cent. on pledge of government bonds, and 5 @ 6 on security of negotiable stocks. Prime mercantile paper was discountable at 7 per cent. for short dates and 8 @ 9 per cent. for four and six months. As to the future of the money market, there is much to encourage the belief that we shall escape this autumn a tight squeeze. It is thought that the demands upon the New York banks for currency to move the crops will be less seriously felt than last year. The currency balance in the Treasury is about ten millions, which is considered ample for all purposes, and it is believed that large amounts of foreign capital will seek investments here this season. A further warrant for anticipating a healthy condition of the money market this autumn is found in the fact that business generally is conducted on a safe and conservative basis, and that there are no evidences of over trading, although the increase in our foreign trade since January 1st, as compared with the corresponding period of last year, is not less than $115,000,000. Generally speaking, the outlook is favorable and encouraging, but we are glad to notice in the West a growing determination to force upon Congress the consideration of the question of free banking during the winter session. That, and the repeal of the law requiring the national banks to keep a reserve equal to 25 per cent. of their demand liabilities, would do much to secure our money markets against sudden or long continued stringency.

In the gold market there has been considerable excitement, the premium having fluctuated within pretty wide limits, as will be seen from the comparison of highest and lowest daily quotations. The advance resulted from the operations of a strong "bull" clique, which has managed to attract a good deal of public notice. The following shows the daily range of the premium:

	Highest.	Lowest.
Thursday	115⅝	115⅜
Friday	116⅛	115⅝
Saturday	116¼	115⅝
Monday	116	115¾
Tuesday	115⅝	115⅜
Wednesday	115⅜	115⅛

The bond market has been dull, and without other feature than the fluctuations in sympathy with gold. State bonds and railway mortgages have been inactive, but the latter remain strong. We quote the closing prices of governments below.

The principal object of the heavy speculators in the stock market during the past week has been to depress prices. The principal dealings have been in Pacific Mail, Western Union, Lake Shore, Ohio and Mississippi, New York Central and Union Pacific. Below we give the highest and lowest of to-day's quotations on the Stock Exchange.

The bank statement shows a reduction in the total liabilities of $7,174,300, and decrease in the total reserve of $4,507,600, the latter caused by a loss of $2,007,700 legal tenders and $2,499,900 specie. The $1,500,000 gold sold by the Treasury, Thursday, was paid for in legal tender notes; but this fact fails to explain the large loss of legal tenders, the payment to the Treasury occurring so late in the week as to count in only one day in the averages. Whatever movement there has been of currency to the interior has been of national bank notes, so that the decrease of over $2,000,000 is unaccountable except on the theory that they have been withdrawn by speculators. The decrease in specie is explained more readily. The banks collectively now hold $6,950,175 lawful money above a 25 per cent. reserve. The percentage of reserve to liabilities of the National banks is 28·28, of the state banks 23·89, the average being 27·72 per cent. The loans of the banks were decreased $2,682,200 during the week. The following is a comparison of the averages for the past two weeks:

	Aug. 16.	Aug. 23.	Differences.
Loans	$292,614,000	$289,931,800	Dec. $2,682,200
Specie	27,644,100	25,144,200	Dec. 2,499,900
Circ'lation.	27,222,700	27,214,400	Dec. 8,300
Deposits	234,857,300	227,691,300	Dec. 7,166,000
Leg. Ten.	47,540,100	45,532,400	Dec. 2,007,700

The following shows the movements in foreign trade for the week:

IMPORTS.

	1871.	1872.	1873.
Tot. for week	$10,383,922	$9,162,526	$8,081,843
Prev. reported	243,063,876	279,809,743	259,514,343
Since Jan 1	$253,447,798	$288,972,269	$267,596,180

Included in the imports of general merchandise for the week are:

	Quant.	Value.
Anvils	21	$140
Brass goods	36	4,635
Bronzes	24	2,647
Chains and anchors	145	8,247
Copper		5,749
Cutlery	190	63,763
Guns	173	21,168
Hardware	48	5,762
Iron, hoop, tons	50	4,031
Iron, pig, tons	1,403	50,096
Iron, sheet, tons	20	3,152
R. R. bars	22,441	396,325
Iron cotton ties	604	1,962
Iron tubes	1,000	2,880
Iron, other, tons	281	21,473
Lead, pigs	2,333	14,693
Metal goods	292	41,376
Needles	9	5,541
Old metal		5,316
Platina	5	11,200
Plated ware	2	917
Percussion Caps	3	877
Saddlery	5	948
Steel	1,408	39,567
Spelter	221,000	12,955
Silverware	4	862
Tin, boxes	21,294	173,090
Tin, slabs, 2769	lbs 162,264	45,436
Wire	459	8,146
Zinc	11,025	767

EXPORTS, EXCLUSIVE OF SPECIE.

	1871.	1872.	1873.
For the week	$4,729,437	$3,906,951	$5,281,459
Prev. reported	145,245,581	138,584,489	179,527,124
Since Jan. 1	$149,975,018	$142,491,440	$184,808,583

EXPORTS OF SPECIE.

Total for the week	$311,649
Previously reported	38,513,581
Total since January 1, 1873	$38,825,230

Government bonds closed steady as follows:

	Bid.	Asked.
U. S. Currency 6s	113½	113¾
U. S. 6s, 1881, reg	117	117⅛
U. S. 6s, 1881, c	119	119⅛
U. S. 6s, 5-20 reg. May and Nov	116⅛	117
U. S. 6s, 1862, c	116⅛	117
U. S. 5-20 1864, c	117	117⅛
U. S. 5-20 1865, c	118⅛	118⅜
" 1867, reg., Jan. and July	117	117⅛
" 1865, con., " "	116⅞	117⅛
" 1867, con., " "	118¾	119
" 1868	118	118¼
U. S. 10-40 reg	113	113⅜
U. S. 10-40 con	116	116⅛
U. S. 5s, 1881, reg	114⅛	114¾
U. S. 5s, 1881, con	114⅛	114¾

The following were the highest and lowest prices of stocks to-day:

	Highest.	Lowest.
N. Y. Cen. & Hudson Consolidated	104½	104¾
Lake Shore	92¾	92½
Rock Island	109	108⅝
Del. Lack and Western	100⅝	100⅜
Wabash	68	67⅛
Western Union Telegraph	90¾	89½
Northwestern	64	64
Milwaukee & St. Paul	50⅝	50⅜
Milwaukee and St. Paul pref	70⅜	70
Pacific Mail	45⅛	44½
Erie	59⅛	58¾
Ohio & Mississippi	39⅛	38⅝
Union Pacific	26⅜	25⅞
C. C. & Ind. Central	30⅜	30
Atlantic & Pacific Preferred	27	26½
Hannibal & St. Joseph	37	36½
Maryland Coal	24¼	24

GENERAL HARDWARE.

The improvement in trade noted last week has since continued, and business may now be called very good. There are a good many large buyers in town who are buying with confidence, and letter orders are coming in freely. Reports from the West are favorable. The crops are turning out well, and both the mercantile and agricultural classes feel in good spirits. One of our leading houses informed us that their mail last Monday was probably the largest they ever received in one day.

Prices of Planes are getting settled down. Russell & Erwin quote discount 25 per cent. for 1st and 25&10 per cent. for 2d quality. The Greenfield Tool Company quote discount 25 per cent. for 1st quality, and the Auburn Tool Company discount 25 per cent. for 1st and 30 per cent. for 2d quality. The following prices were agreed upon on the 5th instant by the Sandusky and Ohio Tool Companies for the goods of their manufacture:

	Discount Per Cent.
1st grade Planes	20
2d grade Planes	20&10
Cooper's Wood Tools, including Tress Hoops	20
Auger, Chisel, File and Saw Handles	20
Bench Screws	20
Bung Starts	20
Gauges	20
Mallets	20
Hand Screws and Cabinet Clamps	25
Rolling Pins, Potato Mashers and Beef Mauls	10
Plane Irons	net
Planes without Irons	net
Planes with English Irons	net

No second grade Planes made except Bench Planes. All invoices made at prices ruling at date of shipment. Prices subject to change without notice to customers. Boxes charged always. Terms thirty days.

Graham & Haines inform us that they have a full stock of Sandusky Tool Company's goods (for which they are agents), and also of Henry Disston & Sons' Saws and other goods, for which they can fill orders promptly.

Trade in foreign Hardware, both English and German, is active, and some large orders have been placed during the past week. Prices are, as a rule, firm, and we know of no change in any of the leading goods. Fine Cutlery is in good demand, with only a moderate supply, and the impression prevails that desirable foreign goods will be in short supply long before the close of the season. Peter Wright's Anvils are quoted at 12¼ cents, gold, for sizes under 250 lbs., and 13 cents, gold, for 250 lbs. and over. Armitage's Mouse Hole Anvils are quoted at 12 cents, and Wilkinson's at 11¼ cents, all gold.

Since the recent advance in England on Coil Chain and Traces already noticed, prices here, although unchanged, are held with greater firmness, and we quote ⅝ inch Coil Chain at 8⅛ cents for small lots, 6½-10-2 Traces at 60 cents, and 7-10-2 Traces at 65 cents per pair, all gold. Stubs' Files are still in very short supply, and desirable sizes almost impossible to find; and this will be the case for some time, as importations are largely sold ahead.

There is nothing new to be said regarding the Nail market. The demand continues fair, and the price firm at $4·50 net for 10d., although, as we before remarked, some holders ask the card rate, viz., $4·75 for small lots. The Eastern Nail mills, which have been closed for several weeks, will commence operations on Monday next, and it is expected that it will take considerable time, in view of the present broken condition of assortments and the reasonable expectations of the wants of the country, before any important accumulation of stocks can be formed.

The break in Westward Freights continues, the following rates (in many cases less than half the usual prices) being those now current for first and second class:

New York to	Cents per Cwt.
Buffalo	22
Erie, Penn	26
Toledo, Ohio	31
Detroit, Mich	28
Cleveland, Ohio	26
Columbus, Ohio	32
Cincinnati, Ohio	37
Indianapolis, Ind	38
Louisville, Ky	49
Nashville, Tenn	73
Memphis, Tenn	98
St. Louis, Mo	55
Fort Wayne, Ind	35
Chicago and Milwaukee	28
Atchison and Leavenworth	97
Kansas City and St. Joseph	97

To the Lake Erie ports, which include Cleveland, Toledo and Detroit, the steam rates have been reduced to 24 cents; and to the Lake Michigan ports, which include Chicago, Milwaukee, and Green Bay, with steam around the lakes, the tariff for first-class goods is 27 cents. The freight agents state that this tariff will probably not last longer than Saturday, the 30th, and that a new union tariff, considerably higher than the one above given, will go into effect on the 1st of September. As yet, however, no such tariff has been agreed upon.

IRON.

American Pig.—The general market has ruled very quiet the past week, and we do not notice any new features of interest. Last year, as well as in former years, the market was quite active at this season. Prices quotably remain about as given last week. Prime Lehigh brands of No. 1 are not obtainable below $45, though occasionally an outside lot of inferior make is offered below that figure. No. 2 brands are still accumulating. Gray Forge abundant and very slow of sale. We only hear of the sale of 50 tons No. 1 Allentown at $45·00. We quote No. 1 $45, No. 2 Foundry $36 @ $38, Gray Forge $32 @ $34.

Scotch Pig.—The stock of Scotch Iron here is exceedingly light of all brands, although quite free shipments of Glengarnock are in transit, and this has a depressing influence on the value of that description. We quote at $44 @ $45. Eglinton is scarce and firmly held at $43 @ $43·50, and we understand $42·50 has been bid and refused. A lot was forced on the market and sold at $42·25, cash, but that can hardly be considered a fair criterion of the market. Gartsherrie is all held by one party, who is gradually peddling it out in small lots at $47·75 @ $48·00. Coltness is also in very light supply, and held at about $50. We only hear of sales of 200 tons Glengarnock and 100 tons Eglinton, both at private terms.

Following are the prices of Scotch Pig Iron in Glasgow, as reported by Messrs. J. E. SWAN & BROS., under date of Aug. 8:

	No. 1	No. 3	No. 4
Gartsherrie	117/6	110/	....
Coltness	125/	110/	....
Summerlee	117/6	107/6	110/
Langloan	119/	109/	....
Govan	109/	107/	107/6
Calder	*117/6	107/6	....
Shotts, Bessemer	165/	160/	....
do Ordinary	117/6	110/	....
Carnbroe	113/	109/	112/
Wishaw	110/	108/	110/
Monkland	112/	108/	....
Chapelhall	120/	108/	....
Clyde	111/	108/	110/
Quarter—Clyde	111/	108/	110/

Glasgow Warrants 3-5, No. 1; 2-5, No. 3, g. m. b. 106/.
*f. o. b. Glasgow, 1/ per ton, extra.

WEST COAST BRANDS—*f. o. b. Ardrossan.*

Glengarnock, Ardeer	113/6	109/	....
Eglinton, Lugar, Muirkirk, Portland	Branded Eglinton. 110/	108/	109/
Dalmellington	111/	108/	106/

CURRENT RATES OF FREIGHT ON PIG IRON.

To	From Glasgow.	From Ardrossan.
New York	7/6	7/6
Boston	17/	17/
New Orleans	20/	20/
Baltimore	17/	17/6
Philadelphia	16/	16/
Providence	20/	15/

Bar.—The demand for Manufactured Iron continues rather light at previous prices.

Old Rails.—There has been a moderate movement in Old Rails the past week, and sales are reported of 250 tons T and Street, 300 tons Bridge, T and Double Head, and 750 tons T and Bridge, all on private terms. The value continues rather weak and in favor of buyers. We quote at $45 @ $46 for T and Double Head.

Rails.—New English Rails are only moderately active, and without new feature of interest. Sales include 1300 tons on private terms, and 3500 tons on credit, with interest. There has been quite a large movement in American Rails, and some 12,000 tons have changed hands, but the price is kept private. We quote at $75 @ $77·50, currency.

We are indebted to Messrs. S. W. HOPKINS & Co., New York and London, for the following statement of the exports of railway iron from Great Britain for the month ending July 31, 1873, and seven months ending at same time, compiled from official sources:

To	M'th. ending July 31. 1871.	1872.	1873.	7 Mos. ending July 31. 1871.	1872.	1873.
United States	42,385	41,305	13,925	287,169	900,316	134,393
British America	9,859	17,324	6,331	37,138	45,572	30,105
Spanish West India Islands	744	373		1,578	1,006	2,718
Brazil	696	438	2,146	12,271	12,840	9,169
Chili	1,733	223		7,223	9,075	3,220
Peru	1,972	713	819	14,067	22,204	3,528
Russia	7,910	6,409	91	54,539	60,004	
Sweden	2,484	163	21,234	6,806	8,857	32,202
Germany	4,722	6,888	7,236	35,690	29,467	
Austrian Territories	3,116	458	3,493	8,934	816	
France	851	23	6,240	1,646	2,905	
Holland	616	345	96	9,340	11,466	
Spain and Canaries	200	204	3,295	6,338	7,159	
British India	889	611	6,820	9,846	9,330	
Australia	284	1,737	27,655	12,584	32,202	
Egypt	885	1,716	10,752	11,000	29,407	
Other countries	6	1,493	1,531	10,173	816	
Total	8,694	13,960	49,143	48,496	70,272	
	88,281	94,593	77,263	564,472	682,695	425,560

Scrap.—The market for Scrap Iron continues quiet, though holders are about steady in their views at $45 for No. 1 Wrought Scrap from yard. Sales 50 tons No. 1 Wrought, from yard, and 60 tons Wrought and Cast, from ship, both on private terms.

METALS.

Copper.—The market for domestic Ingot Copper continues to rule very quiet and transactions limited to the smallest possible quantities to fill urgent requirements. Holders generally ask 27c. for Lake, for cash lots, and obtain that figure for the small lots sold, though it is doubtful, in the present position of the trade, if a round parcel could be placed at that figure. The transactions since our last will probably foot up about 150,000 lbs. Lake, at 27c. There is scarcely any inquiry for future delivery, and though the value is generally held at 28c., this figure, in absence of actual business, must be considered wholly nominal. Manufactured Copper continues steady at late prices. We quote at 40c. for Bolts and Braziers, 38c. for New Sheathing, 45c. for Nails, 26c. @ 27c. for Old Sheathing, 27c. for Yellow Metal Sheathing, 32c. for Yellow Metal Bolts, and 27c. @ 30c. for Yellow Metal Nails, Sheathing, etc.

Tin.—The firmness of holders of Straits Tin still restricts the demand, and we have very little business to report except a few jobbing lots. English, being relatively lower than Straits, is preferred by buyers, though the trade is not very brisk in this description. Banca is dull and nominal. Transactions include about 150 Slabs Straits at 31¼c., gold. We quote Straits, 31¼c.; English, L. and F., 28c. @ 28¼c.; do. Refined, 29½c.; and Banca, nominally, 34c., all gold. Plate were quiet early in the week, though later there appears to be more disposition on the part of buyers to operate, and prices have a steadier tone. We quote: I. C. Charcoal, $10·87½ @ $11·25; I. C. Coke, $8·50 @ $9; Charcoal Terne, $9·62½ @ $10·37½; and Coke Terne, $7·50 @ $8·50.

Lead.—There has been an active movement in both foreign and domestic Pig Lead, resulting in a material advance, the market closing strong at the higher figures. Sales during the week will foot up about 1600 tons, commencing at 6½c. for foreign and 6½c. for domestic, and selling up to 6¾c. for the former and 6¼c. for the latter. The market now is still higher. We quote at 6¾c. @ 6⅞c. for Spanish and German ordinary; 6¾c. @ 7c. for English; and 6¾c. @ 6½c. for domestic, all gold. Manufactured Lead continues steady at 9¼c. for Bar, 10½c. for Sheet and Pipe, and 16½c. for Tin Lined Pipe, less the usual discount to the trade.

Spelter and Zinc.—The movement in foreign grades of Spelter continues sluggish, and transactions limited to small parcels. We note, say, about 100 tons Silesian at 7¾c. @ 7⅝c. for common to prime brands. Domestic is selling moderately at 8⅝c., currency, for Western make. Zinc remains steady at 10c., less 4 per cent., gold, from agents' hands. Sales of 100 casks at that price.

Antimony.—Regulus is selling in small lots at 13½c. @ 13⅝c., gold.

The following is the review of the metal market specially prepared for *The Iron Age* by Messrs. THOS. J. POPE & BRO.:

Business continues very dull, and prices are easier.

INGOT COPPER is 27¼c.

PIG IRON.—American No. 1 extra is $45 per ton for prime brands; No. 2 extra, $36 to $40; No. 2 Foundry, $35; Gray Forge, $33.

SCOTCH is more plentiful and cheaper. Coltness, $50; Gartsherrie, $47·75; Glengarnock, $45 to $46; Eglinton, $43 to $44.

TIN.—Straits, 31¼c.; English Refined, 29½c. to 30c.; English common, 28¼c. to 28½c., gold.

SPELTER—7¼c., gold, for Silesian; 8½c., currency, for American.

LEAD.—All outside lots foreign have been bought up by speculation, and now held at 7c., gold. The high price of foreign Lead has caused consumers to buy American Lead, which they find equal to foreign for ordinary work. Its price now is 6¼c. to 6⅝c., gold.

ANTIMONY—13½c., gold.

PHILADELPHIA.

Messrs. LLOYD, SUPPLEE & WALTON, under date of August 26, 1873, write as follows: Trade has shown quite a considerable increase over either of the preceding weeks, and some of the houses are now quite busy, it being with difficulty each day's work is accomplished without resorting to night work. Large shipments have been made during the last week at low rates of freight, and still larger shipments will go forward during the present week. There is no longer hesitation in regard to prices, the buyers being pretty well convinced many goods are sold without remunerative profits. The questions now asked are, "How soon can these goods go forward?" or, "Can these goods be shipped at once?" and as delays at present are not satisfactory, the houses are kept busy in getting out the goods which are daily sold. We have no changes to make for the week. Prices appear to be comparatively settled.

Messrs. BLAKISTON & COX, 333 Walnut street, under date of August 26, report as follows: *American Pig*—Business is dull. Sales of 2000 tons No. 1 Foundry have been made for immediate delivery at $45. No. 2 Foundry is hard to sell, and will not bring over $40. Sales of Gray Forge are making at $32 at furnace, and $33·50 to $34 here. White and Mottled is held at $29 to $31·50. In reviewing the market for the week and few days past, one fails to note any change. The Lehigh companies are mostly firm in prices, and are not uneasy to sell. It is likely trade will continue in its present state until fall. Consumers are disposed to buy only for immediate wants. The tone of the market is not weak. *Scotch Pig* is held mostly in the hands of one house, and is quoted at $45 to $46 for Eglinton. *Bar Iron* is held at 3 7-10 cents at mill. It is commanding more attention, and the producers are busy. There is more demand. *Scrap Iron* is not noticeable, there being no stock to make mention of, and there seems to be little inquiry for it. *Old Rails* sell at $48·50 to $49 for T's, D. H.'s are quoted at $45. New American command $77 to $80 at mill.

PITTSBURGH.

PITTSBURGH, Aug. 23, 1873.—The long looked and much hoped for revival in the Iron trade has not taken place yet, although it is scarcely possible that it can be much longer delayed. There is little or nothing doing in Pig; buyers, as a rule, are buying only to meet immediate requirements, and as a general thing they have little or no stock, either in yard or contracted for future delivery. The idea still prevails to some extent that it may go still further, and they will not buy to any extent, until satisfied that the lowest notch has been reached. It is not improbable that many of them will hold off too long, for once the market reacts they will all want to buy at the same time, and an advance will probably be the result. Prices within the past week have undergone no change. Best Gray Forge Red Short Mill Irons are still quoted $35, 4 mos.; several sales were made at this quotation, and, from all your correspondent can learn, there is none offering for less. Those producers who are in a position to do so, are out of the market; they are making no effort to sell at present rates, feeling confident that as the demand sets in that they will be able to do better. There are always some of the furnaceman, however, who are cramped for money, and about the only way they have of raising it is to realize on their products; they prefer this, even if they have to sell at cost, to putting out their paper. No. 1 Foundry Irons are selling at from $38 to $41; No. 2, at $34 to $36; Mottled, $32 to $33; White, $30 to $31. There is very little or nothing doing in Charcoal Irons, in consequence of its being so much higher than other grades restricting its consumption; prices, however, remain unchanged, as it is in light supply, $55 to $58 for Warm, and $60 to $65 for Cold Blast. Blooms quiet and unchanged at $100 to $115, according to quality. The furnaces located hereabout, including the Lucy and Isabella, are in blast, though it is not likely to their full capacity, as it is not desirable, in the present condition of affairs, to accumulate stock. However, a large number of those in the Mahoning and Shenango valleys are out of blast, and have been for some time past. The outlook in regard to finished Irons is a little more encouraging. Some of our manufacturers report that they have been getting an increased number of orders recently, and the fact that foreign Irons cannot be imported at present prices in Europe, renders a good fall trade almost certain, notwithstanding it is late in setting in. Prices remain unchanged on a basis of 3¼ cents, time, for Bars. The impression seems to prevail abroad, to some extent, that the card represents the price here, but such is not the case, as the actual selling rate is 5⅛ tenths under the card, or more than half a cent per pound. There is a continued steady demand for Nails, and as the production is comparatively small, and the supply unusually light, there is perhaps a little firmer feeling, but no change in prices. The card remains unchanged at $4·75, but $4·25 is the actual selling price. There is a continued fair demand for the finer grades of Steel, but the common and medium grades are dull. Some of the mills are stopped, but they will all soon be in full blast again. There has been no change of any consequence in prices for almost a year. There is some inquiry for Rails, but mostly on long time, and the mills do not care to sell to such long-winded buyers. The demand, however, is mainly for small lots, and prices remain unchanged, ranging from $80 to $82, time. A good cash buyer could no doubt buy all he wanted at a couple of dollars under quotations. For Corrugated and Galvanized Iron there is a continued fair demand, but there has been no recent change in rates, and the same is equally true of Bolts, Rivets, Nuts, etc. Wrought Tubing is in good request, but unchanged. A good demand is reported for Scales, Locks, Coffee Mills, and "Novelty" goods generally. The Jacobus & Nimick Manufacturing Company report that they have difficulty in keeping up with their orders. The Window Glass trade continues dull and very unsatisfactory, but our manufacturers still entertain hopes of an increased demand, although the prospect of obtaining better prices is not very encouraging. Discounts may be quoted at 65 to 60 and 10.

The *Commercial*, of 23d inst., says: There has been rather more inquiry for pig metal this week than last, but the sales are still confined to small lots for immediate delivery, and to be used by the mills that are running through the hot season. The firms whose works are not in operation are holding out of the market, feeling confident that when ready to buy they can readily secure stock at present prices. The price remains about the same as for the past two or three weeks. We understand that the demand for manufactured Iron has somewhat improved, though prices still rule very unsatisfactory to the manufacturer. We are reported the following sales:

BITUMINOUS COAL SMELTED FROM LAKE SUPERIOR ORE.

300 tons gray forge red short	$35 00—4 mos.
200 tons gray forge red short	35 00—4 mos.
200 tons mottled red short	32 00—4 mos.
100 tons mottled red short	33 00—5 mos.
100 tons gray forge red short	35 00—4 mos.
100 tons gray forge red short	35 00—4 mos.
50 tons gray forge red short	35 00—4 mos.
50 tons close gray and mottled	34 00—4 mos.
20 tons foundry	41 25—4 mos.

ANTHRACITE

30 tons No. 2 foundry	$41 00—4 mos.
20 tons No. 1 foundry extra	42 00—4 mos.
30 tons No. 2 foundry	37 00—4 mos.
20 tons carbonized	30 00—4 mos.
550 tons Chickies foundry at furnace to go West	40 00—4 mos.

CONNELLSVILLE COKE.

250 tons mixed neutral	$33 60—5 mos.
130 tons gray neutral	33 25—4 mos.

BLOOMS.

30 tons charcoal	$105 00—cash.
10 tons charcoal	107 50—4 mos.

CHICAGO.

CHICAGO, Aug. 21—*Hardware*—No remarkable activity has characterized the trade, though prices tend downward. *Iron and Steel*—Demand quiet, prices not quotably varying.—*Journal of Commerce.*

BOSTON.

BOSTON, Aug. 23—The market is quiet, and without improvement, either in demand or prices. The tendency seems to be to make refined bar a leading article, using it as a bait with which to catch other trade, and prices are very irregular. Sales are made all the way from $85 to $95, and possibly, where other goods are to be bought, even lower prices have been named. The cost for most good brands of refined bar to lay down here is from $85 to $89, the Buffalo mills asking 4 cents, equal to $89·60. Some brands of Pittsburg iron can be bought a little better than the price we have named. Pig Iron is dull, and prices lack firmness. Round lots can be bought a little inside our quotations. The nail mills are to start again on the first of next month. They report their stocks considerably reduced since they stopped, many of them not having full assortments of sizes. Prices are unchanged, and it is thought will not be changed at present, though there is some uncertainty. We quote yard lots of American Pig Iron at $45 to $52 per ton, including No. 2 extra at $45 to $46, and No. 1 at $48 to $52. We quote Eglinton at $47 to $48, Coltness at $57, Gartsherrie, $55 to $56, Charcoal at $60 to $70.—*Com. Bulletin.*

CINCINNATI.

Messrs. ADDY, HULL & CO., under date of Aug. 25, writes us as follows: *Pig Iron*:—The demand for best brands of Hanging Rock is improving, sales of some round lots, aggregating 3000 to 4000 tons, having been made to interior points on basis of $48 to $48·50 at Cincinnati on time, and for future delivery. The current demand from the trade for immediate shipment is moderate.

HOT BLAST CHARCOAL.

Hanging Rock	No. 1	$47·00 @ 48·50—4 mos.
" "	No. 2	43·00 @ 45·00—4 mos.
" "	Forge	35·00 @ 36·00—4 mos.
Tennessee	No. 1	44·00 @ 47·00—4 mos.
"	Forge	35·00 @ 36·00—4 mos.
Alabama	No. 1	47·00 @ 50·00—4 mos.
Missouri	No. 1	49·00 @ 56·00—4 mos.
"	No. 2	44·00 @ 45·00—4 mos.

HOT BLAST STONE COAL.

Missouri	No. 1	$46·00 @ 47·00—4 mos.
"	Forge	35·00 @ —4 mos
Ohio	No. 1	42·00 @ 44·00—4 mos.
"	Forge	34·00 @ 35·00—4 mos.
Scotch Pig, No. 1		

COLD BLAST CHARCOAL.

Hanging Rock	Car Wheel	$60·00 @ 65·00—4 mos.
Missouri	" "	60·00 @ 62·00—4 mos.
Kentucky	" "	58·00 @ 60·00—4 mos.
Tennessee	" "	58·00 @ 60·00—4 mos.
Georgia	" "	60·00 @ 63·00—4 mos.
Alabama	" "	60·00 @ 63·00—4 mos.
Machinery and Forge		58·00 @ 60·00—4 mos.
Blooms		112·00 @ 115·00—4 mos.

LOUISVILLE.

Mr. GEO. H. HULL, under date of Aug. 25, writes us as follows: The market for Hot Blast continues dull. Cold Blast is in light supply and firm at full figures. The usual time, four months, is allowed on quotations below:

HOT BLAST CHARCOAL.

No. 1 F'dry, from Hanging Rock Ores		$50·00 @
" 2 " " "		45·00 @ 46·00
" 1 Forge, " " "		37·00 @ 38·00
" 1 F'dry, from Tennessee Ores		48·00 @ 50·00
" 2 " " "		44·00 @ 45·00
" 1 Forge, " " "		37·00 @ 38·00
" 1 F'dry, from Alabama Ores		48·00 @ 50·00
" 1 " " "	Iron Mountain Ores	50·00 @ 52·00

HOT BLAST STONE COAL.

No. 1 F'dry, from Missouri Ores		45·00 @ 46·00
" 2 " " "		41·00 @ 43·00
" 1 Forge, " " "		35·00 @ 36·00

COLD BLAST CHARCOAL.

Car Wheel	from Hanging Rock Ores	60·00 @ 65·00
"	Tennessee Ores	58·00 @ 60·00
"	Alabama Ores	60·00 @ 62·00
"	Georgia Ores	60·00 @ 62·00
"	Missouri Ores	58·00 @ 60·00
"	Kentucky	56·00 @ 62·00

BALTIMORE.

Messrs. WYETH & BROTHER, Iron and Steel merchants, corner of South Charles and Lombard streets, report us the following prices, under date of Aug. 26, 1873: We have to report trade as considerably revived, and with it a decidedly more firm market. Quotation figures are strictly adhered to, and the old habit of shading same for desirable orders is consequently now not heard of. We report the market as firm and improving.

AMERICAN REFINED BAR IRON.

1 to 6 wide by ⅜ to 1 thick	3¾c. to 4c. per lb.
1 to 4½ wide by 1½ to 2 thick	3¾c. to 4c. per lb.
Round and square, ordinary sizes, from ⅜ to 2 inclusive	3¾c. to 4c. "
Hoop Iron, 1½ wide and upward	5¼ to 5½c. per lb.
Band Iron, from 1¾ to 4 in. wide	4¾ to 4¾c. "
Horse Shoe Iron ⅜ to 1 wide by ⅜ to ½ thick	5 to 5½c. "
Norway Nail Rods	8¾ to 8½c. "
Black Diamond Cast Steel, Flats, Squares and Octagon, ordinary sizes	17c. "
Machinery Steel	12c. "
Cast Spring Steel	11c. "
Homogeneous Steel Plate	13c. "
Perkins' Horse Shoes, per keg of 100 lbs	$6·37½
" Mule Shoes " "	7·37½

Common Horse Nails, from 14c. to 18c per pound.

10	9	8	7	6
Putnam Horse Nails..23	24	25	26	28c. per lb.

R. R. Spikes.....5½ by 9-16 at 4¾c. to 5c. per lb.

IMPORTATIONS.

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending August 26, 1873:

Hardware.

Boker Hermann & Co.
Mdse. pkgs., 23
Chains, cks., 11
Casks 2
Beam & Murray,
Anvils, 25
Campbell R.
Cases, 2
Drexel, Morgan & Co.
Files, cks., 1
Field A. & Co.
Mdse. pkgs., 40
Frasse P. A. & Co.
Mdse. pkgs., 2
Hildick A. H.
Chains, cks., 15; pcs., 7
Harmar Wm. & Co.
Mdse. pkgs., 11
Cases, 4
Casks, 1
Harmar, Hayes & Co.
Mdse. pkgs., 3
Jackson Wm.
Packages, 116
King H. & J. W.
Mdse. pkgs., 1
Cutlery, cs., 13
Guns cases, 5
Cases, 1
King, Briggs & Co.
Cases, 5
Laughland & Co.
Wire, bdls., 27
Lan & Garlichs,
Mdse. pkgs., 7
Moss F. W.
Files, cks., 3
Mason John W. & Co.
Wire rope, coils, 13; bdls., 12
Merchants Dispatch Co.
Cases, 8
Casks, 5
Chains, cks., 88
Many F. L. & Marshall,
Mdse. pkgs., 1
Roosevelt S. & Co.
Cases, 2
Russell & Erwin Mfg. Co.
Files, casks 3
Robbins C. & Sons,
Mdse. pkgs., 1
Schoverling & Daly,
Mdse. pkgs., 14
Sanderson Geo. & Co.
Anvils, 1
Tillotson L. G. & Co.
Galvanized wire, lots, 199
Turnor R. A.
Mdse. pkgs., 60
Van Wart & McCoy,
Mdse. pkgs., 313
Chains, cs., 4; cks., 3
Ward Asline,
Mdse. pkgs., 9
Witte John G. & Bro.
Mdse. pkgs., 53
Walsh, Coulter & Flagler,
Casks, 2
Anvils, 48
Western Union Tel. Co.
Gal. wire, lots, 238
Wiebusch F.
Mdse. pkgs., 17
Order.
Cases, 13
Casks, 2

Iron.

Bussing, Crocker & Co.
Pig, tons, 40
Carrington & Co.
Castings, cs., 2
Congreve Chas. & Son,
Rails, 1031
Dickershoff, Raffloer & Co.
Plates, 200
Henderson Bros.
Pig, tons, 400
Hopkins H. & J.
Hoop, bales, 1160
Kuler John,
Bars, 520
Laughland & Co.
Haybands, bdls., 500
Morton, Bliss & Co.
Rails, 550
Maitland, Phelps & Co.
Scrap, tons, 119
Piersons & Co.
Mdse. pkgs., 85
Phelps, Dodge & Co.
Sheet, pkgs., 2315
Seligmann J. & W. & Co.
Rails, 378
Vose, Dinsmore & Co.
Rails, 699
Whitney A. R.
Flues, 70
Order
Bars, bdls., 400
Scrap, lots, 1

Steel.

Hogan John.
Casks, 6
Cases, 35
Hugill Chas.
Bundles, 302
Cases, 12
Lang W. Bailey & Co.
Blooms, 36
Moss F. W.
Casks, 2
Bundles, 209
Bars, 5
Naylor & Co.
Sheet, cs., 6
Bar, cs., 32
Axles, 50
Tires, 28
Cases, 28
Sanderson Geo. & Co.
Casks, 11
Bundles, 30
Slagg Joseph,
Mdse. pkgs., 6
Wardlow W. C.
Mdse. pkgs., 308
Order.
Bessemer rails, 495
Bundles, 722

Metals.

Bruce & Cook,
Tin plates, 500
Dickerson J. S. & Co.
Tin ingots, 400
Hayton B.
Lead, pigs, 2300
Hart Lucius & Co.
Tin, ingots, 300
Maitland, Phelps & Co.
Scrap copper, pcs. 67; hhds., 6; tierces, 3
Phelps, Dodge & Co.
Tin plates, bxs., 13,570
Stout Bros.
Scrap copper, cs., 1
Snow & Son,
Terne plates, boxes, 100
Windmuller & Roelker,
Sheet spelter, cs., 22
Order.
Tin and terne plates, bxs., 7676
Tin ingots, 1158
Lead, pcs., 1853
Spelter, plates, 3900

GERMANY.

(Borsenhalle.)

HAMBURG, Aug. 8, 1873.—*Metals* are, on the whole, inanimate. *Lead* is firmly sustained, German at 25 to 26, English at 26½ to 27; no Spanish here. *Copper*, in consequence of lower English markets, is cheaper here; Northern sorts are 91 to 105 marks. *Tin* is firm, but is only bought in a small way, Banca at 1·50, English at 1·48 to 1·50, and Rods at 1·50 to 1·52½ marks. *Spelter* attracts no attention at nominally 26 marks.

HOLLAND.

(Koch & Vlierboom.

ROTTERDAM, Aug. 12, 1873.—*Tin.*—Some spot transactions have transpired in Banca at 79 to 80 guilders, and deliverable from the coming fall auction at 79 to 78½.

FRANCE.

(Moniteur des Interets Materiels.)

PARIS, Aug. 10, 1873.—*Iron.*—There is no improvement in the general aspect of affairs. Fortunately, production is kept in check by low water and field labor absorbing many hands. Pig Iron is quite neglected; the producer has little inducement to make it and the manufacturer to use it. Wrought Iron is at 280 francs, and slightly below. Machinery, &c., in which the cost of the metal itself is not of much account, is comparatively steady in value. *Steel* is in a better position than Iron, and producers thereof look into the future with great confidence. The great improvement in Iron of late years, without a corresponding amelioration in quality, has more than ever brought prominently forward Steel. The valuable qualities of the latter, its durability and comparatively moderate cost, cause it to be more and more preferred. This more particularly with reference to Rails.

PARIS, August 10, 1873.—Notwithstanding the declining discount and abundance of money, the metal markets pick up with the greatest difficulty. Everybody complains, but nobody can perceive the slightest prospect of a coming change for the better. *Copper* is in no better position than heretofore, nor are the telegrams from Valparaiso of a nature to cause us to expect a speedy improvement. Should shipments from that quarter be resumed on a more extensive scale, we may feel assured that a great decline in England will ensue. High Coal exercises a most depressing influence on Copper. Should Coal not come down with a rush soon, many metallurgical establishments will be closed outright, because they will be virtually ruined. Paris is, however, slightly better with Copper, Chili Bars, deliverable at Havre, being 215 francs, and Ingots 220. Corocoro Ore, 215. Berlin is 30½ to 31. *Tin* has been rather firmer. Straits keeping steady at London at £130, cash, and £128¼ to £129, futures. Liverpool heavy and irregular. Nothing doing at Paris, where Banca is 360, Straits 375, and English 395. Rotterdam is weaker. The German markets show no feature whatever, and business is there of a retail nature merely. Thus at Berlin not a sale was effected during the week. Banca declined there to 45⅛ to 45¾, and English to 44 to 44⅛. Telegrams from Singapore and Penang quote Straits $34¾ and $33, on the 31st ult. *Lead* has led to large dealings at London, 4000 tons being taken for Russia at £21. 10/ to £21. 6/. This is a great deal below current value, L. B. in the open market being £23. Nothing doing here. French Lead is 59 francs; Spanish, 57. All the German markets are quiet, with the sole exception of Hamburg. St Petersburg 29 to 29·40 roubles the 164 kilos. In *Spelter* little doing everywhere, even at London. Paris is weak at 67½ to 69 francs, deliverable at Havre. At Breslau (Silesia) buyers hold back in expectation of a great decline, but holders refuse to make important concessions.

BELGIUM.

(Moniteur des Interets Materiels.)

BRUSSELS, August 9, 1873.—*Iron*—Heavy Rails, according to the last adjudication, under tender have gone at 280 francs. This may, therefore, be put down as the real current value—certainly far from brilliant; yet, while Iron industry in general is unhinged, Rails bear up comparatively well. The Montigny-sur-Sambre furnaces and rolling mills will, for the time being, stop work on the 15th inst. The Southern Company, of Charleroi did so on the 5th inst. The Belgian Lion Society has done the same, and many more of less importance. And how could it be otherwise, when Wrought Iron from 280 has even declined to 270? Pig Iron has experienced another break to 120 to 121¼. Old Cast Iron is down to 90 francs. A man must have a stout belief if he thinks that we are on the eve of an amelioration; prices are, indeed, too high still. If we do not consider them so, it is because we have become accustomed to them. The whole state of affairs would be changed if Coal declined, and we could sell Rails at a profit at 225 to 250, for we do not think that they will decline to 180 to 200 under any circumstances. *Steel* forms an exception here, in England and France.

EAST INDIES.

(Aitken, Spence & Co.)

COLOMBO, (Ceylon), June 28, 1873.—*Plumbago.*—Prices are somewhat easier, but shipments to London and the United States are large, and as tonnage is rather scarce, there is a very eager competition for any available, especially for London, for which 60/ per ton is being paid, the usual rate being about 40/. The *Dunloe* sailed for Philadelphia on the 19 instant with an entire cargo of Plumbago. The *Loch Awe* cleared yesterday, for New York via Galle, taking from here 180 tons of Plumbago; had she not been under engagement for Galle, she could readily have been filled here with Plumbago, of which there is still a considerable quantity offering. The *Chanticleer* is still at Trincomalee, waiting for new pumps. She is expected to sail in about a fortnight. There are no more charters reported for the United States just yet, but it is probable that there will be another vessel to load very soon, as there is sufficient cargo ready. Total shipments from Ceylon to the United States from Oct. 1, 1872, to June 27, 1873, 88,072 cwt., against 43,790 the previous season; to other countries this season, 40,875 cwts., of which 39,823 to England alone. We quote Lump, including packages, per ton, free on board, with commission and exchange at par, 546/; Chip, 263/; and Dust, 136/6; freight, 75/, the 20 cwts.

P. S., July 12.—Prices are still a trifle easier, but we hear of scarcely any transactions for the American market, and those for London are much curtailed. Prices in London, however, appear to be pretty good, as we hear of sales of fine Lump at £36 to £38 per ton. The Magdals has just been taken up to load for New York, and she will probably take about 500 tons. We have not yet heard of the actual departure of the Chanticleer from Trincomalee. She will leave behind 60 tons of her cargo. The Loch Awe will probably leave Galle to-night or to-morrow. Exchange in favor of drawers at 3 to 3⅛ per cent. premium. Closing quotations of Plumbago: Lump, 526/; Chip, 243/, and Dust, 136/6, free on board.

(Rautenberg, Schmidt & Co.)

SINGAPORE, June 28, 1873.—*Tin* has been rising, but again closes weaker. Late arrivals have gone at $35⅛ to $35¼ per picul, equal to £143. 13/10 to £144. 3/9 per ton, cost and freight, but later on $35⅛ to $35 was taken, equal to £143. 3/11 to £142. 13/10 per ton. Larger receipts, in to-day, will no doubt still more depress rates. Nothing doing in *Iron*. No transactions have transpired in *Coal*. West Hartley firmer, Cardiff neglected. Exchange, firm at first, has been weakening. We quote 6 months' London, 4/5¾ to 4/6⅛.

(Schmidt, Kustermann & Co.)

PENANG, July 2, 1873.—*Tin.*—In the earlier part of June prices fluctuated between $33·60 and $34·15 per picul, and at the time of last mail's departure the market closed firm at $33·70. In consequence of more favorable London accounts prices improved to $35, without being sustained, causing the market to close barely steady at $34·10. Exchange declined ⅛d. in the midst of continual fluctuations, in sympathy with the break at Singapore, closing at 4/5¾ to 4/6⅛, 6 months, London.

(Ernsthausen & Oesterley.)

CALCUTTA, August 12, 1873.—*Metals*—English Tile, 34 rupees. Spelter, real Silesian, 10·4 rupees. Yellow Metal, 32·12.

CHINA.

(Siemssen & Co.)

SHANGHAE, June 14, 1873.—Little doing in Metals. *Nail Rods* firm. Asking rates and offers are wide apart. 5000 bundles Dawes brought 3·62 taels, and 2400 M. M., 3·40. *Rod Iron*—3·50, nominally. *Lead*—L. B. is firmly held at 5·55 to 5·60, without buyers at this. *Steel*—German, 5 taels; Swedish, 4·30 to 4·70 taels per picul. *Coals*—Few dealings, and prices nominally sustained. Demand light, and mostly limited to Japanese and Formosa. American Anthracite, 10⅛ to 10·60 taels per ton. *Exchange*—Six months London, 6/¾ to 6/1⅛.

The August Coal Sale—Another Advance in Prices.

The regular monthly auction sale of Scranton coal took place yesterday, at the salesroom of the Delaware, Lackawanna and Western Railroad Company, No. 26 Exchange Place. Ninety thousand tons were offered on the usual terms and conditions, which were read by the auctioneer. The attendance was very large, and the sales were made rapidly at a slight increase in price as compared with the sales of last month. The average increase on steamboat was 11¼ cents; on grate, 5 cents; on egg, 8¾ cents; on stove, 8⅝ cents, and on chestnut, 5 cents. There was no lump coal offered. The prices obtained this month compare as follows with those obtained at the last sale in July:

Tons.	July 30.	August 27.
Steamboat 10,000..	$4·65@$4·87½	— @$4·87½
Grate.....25,000..	4·95@ 5·00	$5·00 @ 5·05
E g..... 7,000..	5·25@ 5·35	5·37½@ 5·40
Stove.....35,000..	5·30@ 5·42½	— @ 5·45
Chestnut..13,000..	4·70@ 4·75	— @ 4·77½
90,000		

The Fire at the Boonton Nail Works.

We are glad to announce that the damage resulting from the fire which broke out in the extensive nail manufactory of Messrs. Fuller, Lord & Co., at Boonton, N. J., is much less serious than was at first reported. Fortunately, the works are so situated that no danger of their complete destruction by fire can be said to exist. A branch of the Morris Canal runs through the works, on one side of which stands the principal part of the establishment, and on the other four buildings, comprising the cooper shop, in which were made the kegs needed for packing the product of the nail mills, a saw mill, a factory containing machines for making some of the smaller sizes of nails, and storage accommodation. The saw mill and nail factory occupied one building, a two story brick, the saw mill being in the basement and the factory in the upper part. About 11 o'clock on Sunday night the fire broke out in the saw mill, and spread with rapidity, so that in a few hours the four buildings and two store sheds adjoining were reduced to a pile of *debris*, together with machinery worth $15,000 and considerable stock. Fortunately, the wind was blowing from the west and not from the east, or the main factory would surely have been reduced to ashes also. Boonton has no fire department. The saw mill contained some 40 machines, and employed about 50 hands. About 1000 kegs of nails were turned out per day. The amount of stock destroyed was trifling compared with the loss in keg material. About 4,000,000 staves were burned up. The total number of hands employed in the works was between 700 and 800 persons. The burned district covered over an acre of ground. No time will be lost in providing work for the people thrown out of employment. We are informed that there will be no suspension of operations in the rest of the works, and it is doubtful if customers of the house will experience any inconvenience, unless it be from the unavoidable delay in filling orders for certain special sizes of nails for which the machinery was destroyed. The firm were carefully insured, but their losses are not entirely covered.

Base Ball.

The following is the score of a game of base ball played on Saturday last on the grounds of the Chrome Steel Company, of Brooklyn, E. D., between picked nines from the Atlantic and Chrome Steel Works. Time of game two hours.

Innings.....	1	2	3	4	5	6	Total.
Chrome Steel Works	4	1	10	4	16	6	41
Atlantic Steel Works.	8	1	4	0	0	1	14

Owing to the late hour at which the game commenced, it had to be decided in six innings.

Our English Letter.

Review of the British Iron, Steel, Metal and Hardware Trades.

(From our Regular Correspondent.)

SHEFFIELD, Eng., August 12, 1873.

It would appear that, at present, we are not destined to see lower quotations. Orders of more or less urgency and of fair size have been given out in various directions, mostly by the London, Liverpool, Birmingham and Wolverhampton, or Sheffield factors, and have tended to give considerable confidence to producers. These requirements, it is believed, are generally on shipping account for the Colonies and Northern Europe; in the latter case delivery in full being made a *sine qua non* before the closing of the Baltic shipping season. Finished iron has therefore not gone back in any degree, but on the other hand has a decidedly stronger tone. Common bars in the South Staffordshire district are fairly firm at £12. 5/; medium, £12. 15/, and best £14. Sheets (singles) are stationary at £15, plates, £16 to £18, and hoops, £13. 10/ to £15. Hot blast native all mine is £7 to £7. 10/, and cold blast £8 to £8. 5/; part mine at £6 to £6. 10/, and cinder pig £4. 15/ to £5. 2/6. Australia and China are taking a few B B H sheets, and India, as well as the Southern States of America, are our customers for cotton tie hoops. In the Middlesborough (North Yorkshire) locality an increase of makers' stocks of pigs has taken place to the extent of over 6000 tons, although shipment had been in excess of the corresponding weeks of last year for some time prior to the making up of the return. Pig iron at Middlesborough commands 105/ for No. 1; 95/ to 97/6 for No. 3, and about 85/ for No. 4. Ironstone and fuel are in better supply, but are no cheaper, hence no great amount of activity prevails in the whole Cleveland iron district. At Sheffield this week there is no further decadence of trade to record, matters having apparently reached a point where there is to be a temporary suspension of dullness. Swedish, Russian, and certain brands of other iron, are slightly easier, the former having latterly been forced up to perfectly abnormal quotations.

Best Yorkshire boiler plates, merchant iron of almost all descriptions, and steel rails, are unaltered in price, there being as yet a fairly brisk inquiry for them. The rail mills and machine shops are still well employed, the rails being chiefly on East Indian, Russian and Colonial account. Certain offers of not very heavy contracts for tram rails of a peculiar section—serrated bearing surface, etc.—have, I hear, been refused by one or two large firms here, on account of the trouble and expense to be incurred in roll-turning. They have, it is understood, been placed with smaller firms in the Leeds district, who are not quite so particular in these respects, or have, we will assume, greater facilities for turning rolls of varied sections.

Orders for steel are not heavy, and not by any means over plentiful. American customers of calibre who use the best tool, axe, plow plate, and other steel that we can turn out, are taking much the same quantity as usual; but second-class importers and chance customers are limiting their orders to very narrow indents.

The rolling mill proprietors have, like other firms in different branches, put their works on short time, and the forging and tilting firms, who work for hire, have reduced prices by advancing discounts from 15 to 27½ per cent.

The engineers' strike remains in *statu quo*, the employers having unanimously decided not to concede the advance demanded. The number of men out diminishes weekly in a rapid ratio.

In the file and saw and some other minor trades there is a fair stroke doing; but in hardly any one instance do I hear of anything like pushing activity. Some firms, are in fact, stocking for the autumn.

The market for Scotch warrants is rather uncertain just now, prices for g. m. b. being moderately steady at 107/6. The various West Coast brands are not largely altered. Prices of these are now: Gartsherrie No. 1, 120/; No. 3, 112/6; Coltness No. 1, 125/; No. 3, 110/6; Summerlee No. 1, 120/; No. 3, 109/; Carnbroe No. 1, 114/; No. 3, 110/; Monkland No. 1, 112/6; No. 3, 109/; Clyde, No. 1, 112/6; No. 3, 109/; Govan No. 1, 112/; No. 3, 109/; Langloan No. 1, 122/6; No. 3, 109/; Calder No. 1, 120/; No. 3, 110/; Glengarnock No. 1, 115/; No. 3, 111/; Eglinton No. 1, 112/; No. 3, 110/; Dalmellington No. 1, 111/; No. 3, 109/; Carron No. 1, 120/; Shotts No. 1, 117/6; No. 3, 110/; Kinnell No. 1, 115/; No. 3, 110/. Shipments of Scotch pig iron are still decreasing, last week's total being nearly 1000 tons under that of the corresponding week of last year. Total shipments for the year are 395,442 tons, as compared with last year's total up to the same week of 582,623 tons, showing the very material decrease of 187,181 tons. Manufactured iron is somewhat cheaper, and will probably go down yet further, should Scotch pig become lower within the next few weeks. The shipbuilding trade is not so prosperous, as is evinced by the following statement. The number of ships launched during the month of July was 11, with a tonnage of 13,500, as compared with 17 having a tonnage of 19,000 in the same month of 1872. The comparison between the seven months of both years is even more striking as regards the number of vessels, but the tonnage is in favor of the seven months of the present year. The largest vessel launched last month was the Valparaiso, 3700 tons and 550 horse-power, for the Mersey and Valparaiso mail service of the Pacific Steam Navigation Company, of Liverpool, the builders being Messrs. John Elder & Co., of Fairfield, Govan. Messrs. R. Duncan & Co., of Port-Glasgow, have an order for two sailing ships of 1200 tons each for the New Zealand line of Messrs. P. Henderson & Co., Glasgow, and Messrs. Caird, of Greenock, are building the "Minister Von Roon," 3200 tons, for the North German Lloyds.

In Wales there is a moderate amount of activity, mostly in rails and bars. The only shipment of note last week was one of rails from Laughlands to New York, and one from Rhymney to Riga. Prospects are not, on the whole, of the most hopeful nature, and more than one large establishment in South Wales and Monmouthshire is running half time. At Plymouth Works last week the mills were quite idle. Some curiosity has been expressed as to the tenders just sent in for steel rails to the Belgian government, the lucky competitors being Messrs. Schneider, of Le Creuzot, France. The quantity required was 12,000 tons, and tenders were offered by the following firms: Messrs. Schneider & Co., of Le Creuzot; Messrs. Tiden, Nordenfelt & Co., of London; the Ebbw Vale Company; the Cockerill Company; Messrs. Adhewar, Le Roy & Co., of St. Jean; Messrs. Brown, Bailey & Dixon, of Sheffield; Mr. Fowler, of Brussels; the Angleur Steel Works Company, Liege; and the Schlessin Works, Liege. The lowest tender was £18. 2/6 per ton, and the highest (that of the Schlessin Company) was £19. 2/ per ton. It is something creditable to the Messrs. Schneider that they should be able to beat both English and Belgian competitors, the latter almost on their own ground. The labor market is fairly quiescent, and its special organ, the *Labour News*, says of it: "The labor market remains in much the same condition as reported last week. The depression in many branches of trade which has been noticeable for some weeks past still continues, and even in South Wales, where hitherto the greatest activity has prevailed, orders are becoming scarce. In London several large building undertakings are likely to occupy the operatives in that branch, and, generally speaking, the trades are well engaged. Some of the surplus metropolitan labor is now taking its annual exodus to the harvest, but in some districts a considerable scarcity of hands in getting in the crops is likely to be experienced. From the hop fields prospects are reported as somewhat more favorable. Under the head of emigration a scheme for an extensive movement of agricultural laborers, under the auspices of the National Union, may be mentioned; otherwise the stream of emigration is not so strong as it has been for some months past. South Australia has, however, now come prominently forward in the competition for English labor, and free passages for certain classes of workpeople are now offered. Queensland and New South Wales are also bidding for eligible settlers. No new strikes of any great importance, either at home or abroad, have occurred during the week." This, however, is hardly a comprehensive view of the matter, seeing that we are very probably on the eve of a great lock-out. On Friday a special meeting of the Iron Trades Employers' Association was held in Manchester, mainly to consider the demands of the men in relation to matters generically termed the government of the "shop"—a collateral issue of the engineers' strike at Sheffield. The particulars of this dispute have previously been detailed, with the demands of the men for overtime payment, etc., but I may just remention that the chief point in dispute is that they refuse to work overtime unless *each day* stands by itself in the computation for pay. The employers, quite naturally, say that this is a perfect arbitrary request, and that to concede it would be to encourage idleness and drunken workmen. The workmen, however, having persisted, the employers at this meeting resolved to lock out all the men in the district on the 23d instant, unless they gave way—an improbable contingency. In Scotland the dispute between the mine owners and miners, which lasted six or seven months, has been terminated, special rules having been drawn up and agreed to by both sides; and the dispute as to weighing in Wales has been brought to a close by the adoption by both parties of the imperial weight to the ton. Other than these there are no strikes or wages disputes of importance.

After this it is not uninteresting to gather from the Board of Trade returns for the month of July that there has been a slight recovery in both our exports and imports, although the comparison of this with last year redounds to the credit of the latter. The declared value of our exports for the month was £22,957,404, against £23,005,330 in July, 1872, or a decline of £47,926, equal to 1-5th per cent. In coal, notwithstanding the high price, the export increased 1½ per cent. in quantity, and about 43 per cent. in value. The total value of our exportations during the first seven months of the present year was £148,743,961, showing an increase of 4¼ per cent. on the corresponding period of last year, and 20¼ per cent. on the corresponding period of 1871. The exports of iron show no falling off, though the tonnage still compares unfavorably with last year. Of iron and steel of all descriptions we exported last month 267,510 tons, of the value of £3,468,725, as compared with 316,462 tons, value £3,325,981 in 1872, and 312,237 tons, value £2,505,636, in July, 1871. Thus, 15 per cent. less iron than in July, 1872, produced £143,000 more money; and 14 per cent. less iron than in July, 1871, produced £963,000 more. For the seven months our iron exports have been 1,799,577 tons, value of £22,635,811, as against 1,991,270 tons, value £19,332,607, in 1872, and 1,752,432 tons, value £14,284,403, in 1871. Roundly speaking, the tonnage is about 10 per cent. less, and the value about 22 per cent. more this year than last. The increases of value for the month are in railroad, wire, common and telegraphic, cast and wrought, hoops and sheets, and unwrought steel, and decreases in pig and puddled, bar, and old iron. Subjoined are totals of values:

Iron.	Month of July, 1872. £	1873. £	Seven Months. 1872. £	1873. £
Pig and puddled.	712,546	604,387	3,673,833	4,614,128
Bar, angle, &c...	363,360	328,618	2,036,123	2,261,213
Railroad.....	968,294	1,017,964	5,344,727	5,604,841
Wire.....	52,157	57,869	857,041	424,939
Telegraphic wire.	61,015	197,207	171,013	893,647
Cast and wrought	403,032	525,051	2,511,389	3,235,171
Hoops, sheets, &c	294,736	320,433	1,701,808	2,258,151
Old iron	80,194	14,065	404,194	288,919
Steel, unwrought	124,394	139,009	820,734	890,393

Machinery and mill work show large increases, both for the month and the seven months. For steam engines the total for the month is £292,394, as compared with 236,963 in 1872, and £165,127 in 1871, or an increase of over 24 per cent. in the former case, and nearly 80 per cent. in the latter. For the seven months the totals for three years respectively are £1,715,618 in 1873, £1,416,930 in 1872, and £1,104,152 in 1871. In copper of all descriptions, including sheathing, there is a considerable falling off both in quantity and value, the total weight in hundreds being 55,853, value £2 6,433, as compared with 57,068, value £299,091 in July of last year. For the seven months the comparison of quantities and values is satisfactory.

In July we exported of coal, cinders, and manufactured fuel, 1,181,622 tons, valued at £1,215,027, as against 1,164,233 tons, valued at £850,376, for the corresponding month of 1872, and 1,126,901 tons, valued at £595,883, for the corresponding month of 1871, thus showing over July, 1872, an increase in quantity of 17,389 tons, and an increase in value of £364,651, and of July, 1873, as compared with July, 1871, an increase in quantity of 54,721 tons, and an increase in value of £679,144. The exports of coal to Russia, Sweden and Norway, Denmark, Germany and Holland, show a falling of in quantity, but the value remains about the same—while France, Spain, Italy, Brazil, British India, and other countries, show an increase both in quantity and value. The largest increase is in the export to France, which in July, 1873, took 205,562 tons against 153,880 tons in July, 1872. Germany, on the contrary, shows a marked decrease, taking only 192,999 tons in July, 1873, as against 264,597 tons in July, 1872. In the seven months ended July 31, 1873, we exported 7,200,532 tons of coal, valued at £7,625,615, as against 7,610,313 tons, valued at £4,820,506, in the corresponding seven months of 1872. The return for France perhaps best shows the increased value of coal. In the seven months ending July 31, 1873, we exported to that country 1,377,894 tons, as against 1,373,958 tons in the corresponding period of 1872; but in the former seven months (1873) the value is returned as £1,290,716, while for the latter (1872) it is but £747,931. Of hardware and cutlery the following is the return for 1872 and 1873:

HARDWARE AND CUTLERY.

To	Month ended July 31. 1872.	1873.	Seven Months ended July 31. 1872.	1873.
Russia.....	16,355	20,211	77,078	91,723
Germany.....	28,358	34,572	198,238	208,649
Holland.....	12,154	11,606	67,731	69,662
France.....	17,142	14,229	98,554	92,667
Spain and Canaries.....	9,634	8,146	60,423	56,043
United States.....	80,212	67,453	519,141	479,805
Spanish W. India Islands	15,237	19,615	69,794	93,186
Brazil.....	28,422	22,511	151,891	165,077
Argentine Republic.....	17,621	15,280	109,961	118,802
British North America..	31,569	29,317	164,741	137,349
British India.....	21,509	22,851	153,842	121,562
Australia.....	40,934	40,150	251,366	321,106
Other Countries.....	132,689	154,840	856,573	931,569
Total.....	448,836	460,811	2,779,333	2,889,390

Thus the exports to Russia, Germany, the Spanish West India Islands, India, and "other countries," show an increase; those to France, Holland, Spain, the United States, Brazil, the Argentine Republic, and British North America, exhibit a decrease, those to Australia remaining stationary. Under pig iron we find the exports for the month of July last to be 98,861 tons, valued at £604,387, as against 133,084 tons, valued at £712,546 for the corresponding month of 1872. Of the total amount of 98,861 tons exported in July, 1873, Germany and Holland took the largest share, the former being credited with 28,718 tons, and the latter 25,962 tons. The total export for the seven months of the present year was 733,606 tons, valued at £4,614,128, as against 810,468 tons, valued at £3,673,833 for the corresponding seven months of 1872. Of bar, bolt and angle iron we exported in July, 1873, 25,276 tons, value £324,618, as against 30,262 tons, value £363,360 for the corresponding months of 1872. Of railroad iron the following is the return of values:

RAILROAD IRON, ALL SORTS.

To	Month ending July 31. 1872. £	1873. £	Seven months ending July 31. 1872. £	1873. £
Russia.....	66,081	281,766	277,522	904,643
Sweden and Norway.....	2,623	90,841	83,147	286,229
Germany.....	79,697	44,262	311,326	403,879
Holland.....	7,176	45,138	36,218	160,055
France.....	690	2,263	4,366	31,707
Spain & Canaries	1,645	7,684	56,800	100,259
Austrian Territories.....	3,970	8,115	61,660	9,773
Egypt.....	110	17,130	101,576	36,478
United States....	467,176	186,244	2,864,328	1,729,763
Spanish West India Islands.....	4,242	....	9,842	34,756
Brazil.....	4,289	26,511	104,992	80,239
Peru.....	8,142	1,773	195,863	81,075
Chili.....	7,225	4,264	24,525	46,014
British North America.....	190,283	73,276	518,396	460,349
British India.....	20,184	26,248	88,693	160,030
Australia.....	19,678	23,451	132,052	164,554
Other countries..	75,483	179,048	473,221	914,438
Total.....	968,291	1,017,964	5,344,727	5,604,841

The metal trade is not specially brisk. Messrs. French & Smith, of London, report in their monthly circular that in *Copper* there has been no activity, but a steady demand for consumption has given a healthy tone to the market. For foreign, values have slightly increased, but English has been neglected, except at rates considerably below nominal quotations. In furnace stuff transactions have been limited, 15/6, being the last price paid for Regulus. Charters from the West Coast, for the latter half of June, are given as 900 tons fine, composed of 400 tons bars, and 300 tons ores and regulus for England, and the remainder for the Continent. We quote Chili bars £81. 10/; Wallaroo, £91; tough, £88; best select, £90; manufactured, £96 to £100. *Tin.*—During the month there has been no speculative inquiry for tin, but a steady demand for consumption. The stocks of foreign lying in London have decreased about 200 tons; English was also fairly in demand. The most important point to be regarded as to the future of the tin market is the quantity of Australian ore to be expected; as to this there is no certainty, but it is certain that a large quantity does arrive, and is sold, and at each sale there is some reduction in value from the one preceeding. Whether lower prices will check the shipments is yet to be seen. We may, however, be sure that these arrivals, if continued, will ruin many of the Cornish mines, and does now cause a falling off in their production. The quantity of Australian ore sold by tender last month was 531 tons, of various quality, at prices ranging from £5 to £82. 5/ per ton of ore. The quantity of metal contained is about 320 tons. On the 5th instant were sold 260 tons; on the 7th (this day) are sold 150 tons; and on the 19th instant will be sold 35 tons—in all 445 tons of ore, equal to a about 270 tons metal. The ores on the 5th instant were sold at prices from £15 to £78. 2/6 per ton; to day they realized prices from £5 to £77. 15/ per ton. Banca in Holland is firm at 79½ to 80 guilders; Billiton, 78 to 78½. The deliveries from Holland during July were 9000 slabs Banca—280 tons; Billiton, 3800 slabs—120 tons; and from London, 510 tons. Deducting from this 40 tons Banca and Billiton received from Holland, makes a total delivery of 870 tons.

Messrs. Rogers & Sons' Liverpool report is as follows: *Copper.*—The statistical position of this metal continues to improve. Imports steadily decrease, whilst exports increase; and the home trade, though not so well off for orders as last year, are nevertheless fairly employed, and at remunerative prices. In the six months the actual decrease in imports as compared with '72 is 6213 tons. The increase in exports is 6795 tons. Taking these two items together, a difference in the figures as compared with August, '72, of over 13,000 tons. The actual decrease in the stock of copper in the public warehouses is apparently only 3000 tons from the highest point reached last year. The inference, therefore, is that at least 10,000 tons has been drawn from the smelters and the surplus stocks of manufacturers generally, leaving both these very bare of raw material. Speculation has for the present entirely disappeared from the copper market, and the business doing is purely for export and consumption, all the orders passing from day to day being given out on the condition of immediate delivery. The late reduction in the fixed prices of brass and yellow metal will give an impetus to the demand for copper, as these two articles have been kept up unduly, and rather to the injury of the trade in them. For the latter, especially, there is already far more demand. *Lead.*—A very large business was reported last week for Russia, at a considerable reduction on prices lately ruling; there appears no doubt that a portion of this business was transacted, though the quantity seems to have been exaggerated. Best brands maintain their price within about 5/, and there seems no pressure to sell. There has been more doing for China, but the shipments are still only about one-fifth, for the seven months of this year, of the usual supplies, and Messrs. Von Dadelzen & North's usual weekly remarks are as under: "The metal market opened quietly this week, and prices do not show any material change from last week's quotations. *Iron.*—The position in Wales and Staffordshire remains the same, orders are still withheld in anticipation of lower prices. Scotch pig-iron has declined to 106/3, cash. The shipments last week were 10,187 tons, against 14,494 last year. *Copper.*—No fresh feature to report; both Australian and Chili remains as quoted last week, viz., Chili good ordinary brands, £81. 10/; special brands, £83; Wallaroo, £90. 10/ to £91; Burra, £90. 10/. English, both raw and manufactured, somewhat firmer. *Tin.*—Steady, but quiet. Straits £130 on the spot and to arrive. Banca, £133. The Dutch market is firm at 79½ f.; 18,000 slabs Billiton tin found buyers in Batavia on Monday last at 85½ f. per picul, equal to 79½ f. laid down in Holland. English tin dull. Tin-plates are lower, more particularly cokes, which are obtainable from second hands at 31/. *Lead.*—Firmer and in better demand; good ordinary soft pigs £22. 10/ to £22. 15/; LB, £22. 17/6 to £23. *Spelter.*—Nothing openly reported; the nominal quotation for the various kinds is about £25. *Quicksilver*—£15." These, combined, will give a fair reflex of the metal trade from different points of view.

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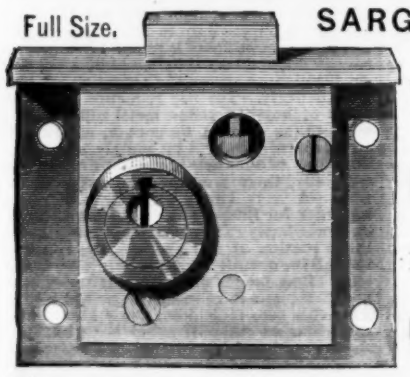

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UNPICKABLE LOCKS.

Drawer, Trunk,

HOUSE AND STORE DOOR LOCKS,

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Night Latches, Etc.,

WITH FLAT GERMAN SILVER KEYS.

Combination Bank and Safe Locks.

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For Stove, Furnace, Conductor, and all other Sheet Metal Pipes, With Universal Adjustable Joints.

Can be changed at will to any desired angle. Its advantages over all other Elbows are at once apparent.

For Beauty, Strength and Durability it is Unequaled.

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New York Fire Brick &

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CLAY RETORT WORKS,

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The largest stock of Fire Brick of all shapes and sizes on hand, and made to order at short notice.

Cupola Brick, for McKenzie Patent, and others. Fire Mortar, Ground Brick, Clay and Sand. Superior Kaolin for Rolling Mills and Foundries. Stone Ware and other Fire Clay and Sand, from my own mines at New Jersey and Staten Island, by the cargo or otherwise.

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AND

Clay Retort Works,

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PHILIP NEWKUMET,

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Articles of every description made to order at short notice, and in a very superior manner.

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of reliable quality for all purposes, manufactured of the best New Jersey Fire Clays. Also, MINERAL KNOBS, ROCKINGHAM WARE, Fire Clay, Fire Sand, Kaolin and Ground Fire Brick.

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ADAM NEWKUMET,

1537 & 1539 N. Front St., Phila., Pa.,

For Steel, Brass, Nickel, Copper, Bronze, &c.

Equal to any in the market, and all guaranteed.

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BRICK PRESSES,

For Fire and Red Brick.

PATENT STEAM GEARING

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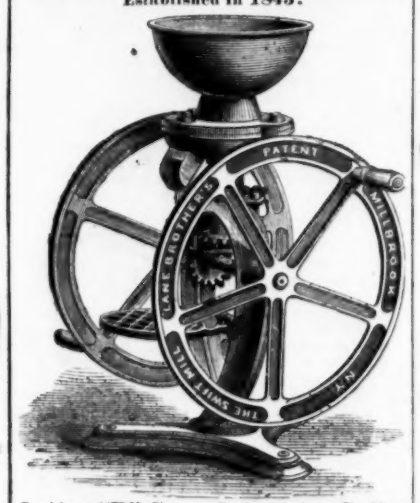

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The sliding bolt "C" moves with the rod as the power is applied, and is slipped into the bracket "D," holding the rod at the desired tension.

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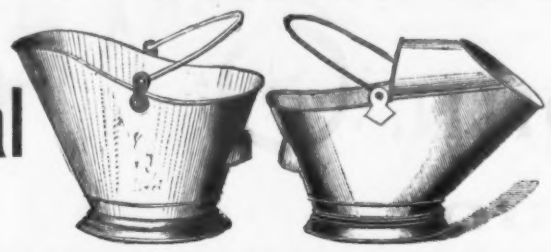
Coal  Hods.

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Steam Engines, Boilers & Heavy Machinery of all kinds, and Heavy Forgings.

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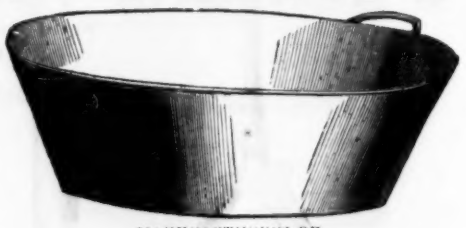

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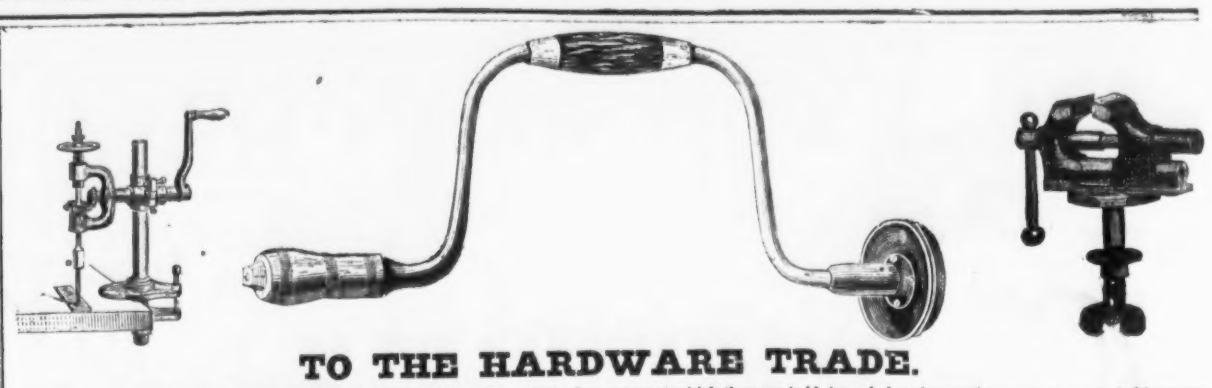

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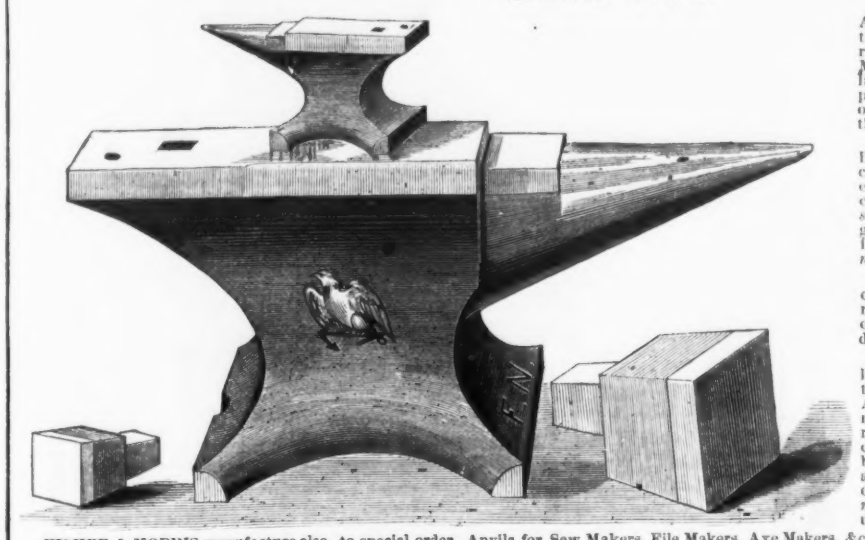
The Fisher & Norris Eagle Anvil Works.

(ESTABLISHED 1843.)



These Anvils are manufactured at the oldest Anvil Factory in this country, and for the past twenty-five years have maintained an excellent reputation among Blacksmiths, Machinists, Tool Makers, &c. They are *superior* to the best English, or other Anvils, on account of the peculiar process of their manufacture (invented and used only by this concern), and from the quality of the materials employed.

The working surface is in *one piece* of JESSUP'S BEST TOOL CAST STEEL, which, after being accurately ground, is hardened and given the proper temper for the heaviest work. The *horn* is covered with and its extremity made *entirely of steel*. The body of the Anvil is of the strongest grade of American iron, to which the cast steel face is *warranted to be thoroughly welded and not to come off*.

The best of English Anvils, after a time, become hollowing on the face by continued hammering in use, on account of the fibrous nature of the wrought iron—causing it to "settle" under the face.

The body of the Eagle Anvils being of crystallized iron, no such settling can ever occur; and the steel face, therefore, remains perfectly true. Also, it has the great advantage that being of a more *solid* material, and consequently with less rebound, the piece being forged receives the full effect of the hammer, instead of a part of it being wasted by the rebound, as is the case from a wrought iron anvil. An equal amount of work can, therefore, be done on this Anvil with a *hammer one-fifth lighter* than that required when using a wrought iron anvil which is more elastic.

FISHER & NORRIS manufacture also, to special order, Anvils for Saw Makers, File Makers, Axe Makers, &c; also, Copper Smiths', Silver Smiths' and Tinmen's Stakes and Blocks, with hardened and polished cast steel faces, and the well known Double Screw Parallel Vise.

PRICE LIST, May 1st, 1873.

ANVILS weighing 100 lbs. to 600 lbs., 12 cts. per lb.

Smaller Anvils, ("Minims.")

No.	0	1	2	3	4	5	6	7	8	9
Weighing about	10 lb.	15 lb.	20 lb.	30 lb.	40 lb.	50 lb.	60 lb.	70 lb.	80 lb.	90 lb.
Price,	$4·00	$5·00	$6·00	$6·50	$7·00	$8·00	$9·00	$10·00	$11·00	$11·50

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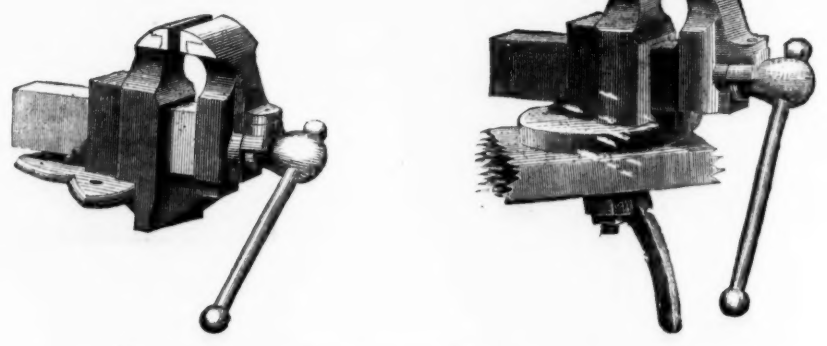
PARALLEL BENCH VISE.



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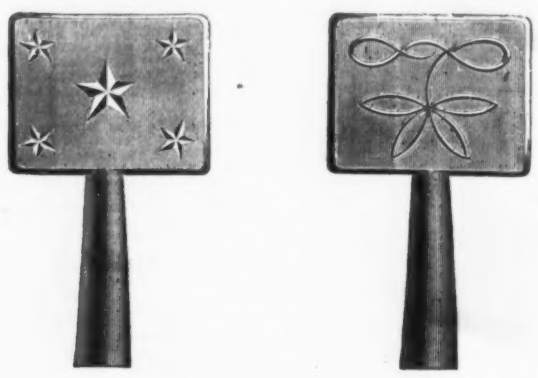
MANUFACTURERS OF

CARRIAGE MAKERS HARDWARE

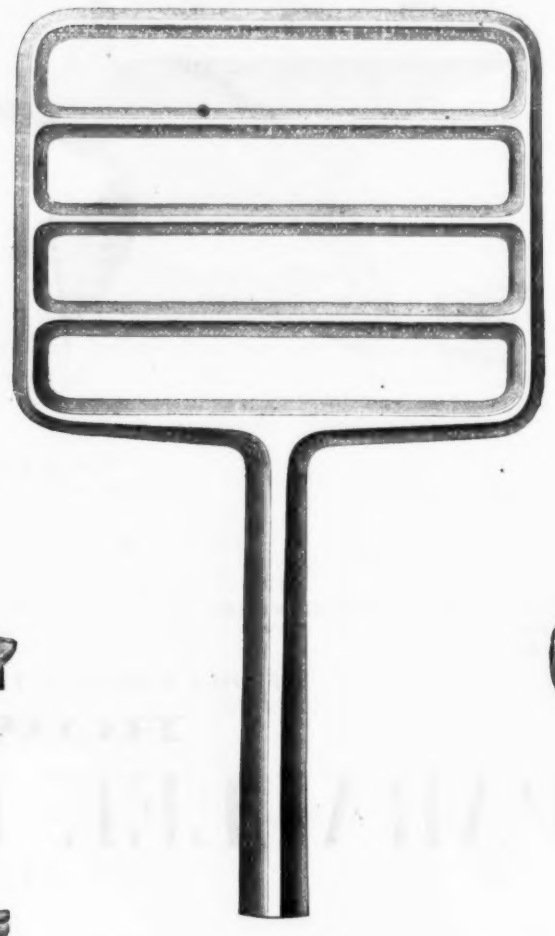
S TRADE MARK. PLANTSVILLE CONN. TRADE S MARK.

ESTABLISHED 1850.

Embossed Step Rods.
Star Pattern. *Leaf Pattern.*



Coach Steps—Gridiron Pattern.



Step Pads.
Plain Pattern.

Open Step Pads—Cross Bar Pat'n.
Upper View. *Lower View.*

Smith's Slat Irons.
New York Pattern.

Smith's Slat Irons.
Philadelphia Pattern.

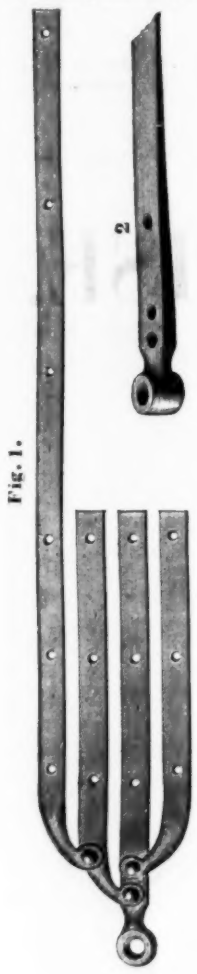
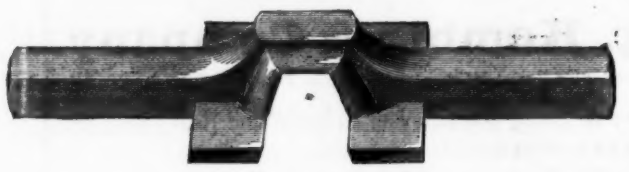


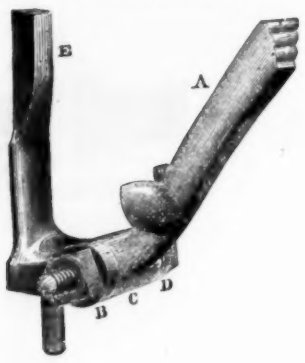
Fig. 1.

Coach Axle Clips.

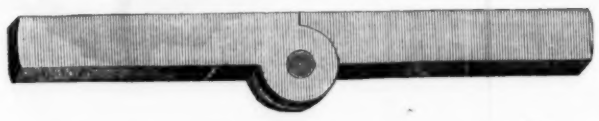
Coach Spring Clips.



Shaft Couplings.
1871 Pattern.



Smith's Milled Stirrup Joints.



Shaft Couplings.
Straight Ear Pattern.

Double Point Pattern Axle Clips.

Whiffletree Bolts.

Clip King Bolts.
Excelsior Pattern.

Smith's Improved Plain Pattern Axle Clips.

Solid Double Saddle Clips.

Brewster & Co. Whiffletree Plates.

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Above are a few illustrations of our Forged Carriage Irons. We manufacture a large variety of patterns and sizes of **Shaft Couplings, Slat Irons, Step Pads, Axle, Spring Bar, Saddle and Coach Clips; Fifth Wheels, Steel and Iron Felloe Plates, Smith's Milled Stirrup Joints, Clip Yokes, King Bolt Yoke and Brace, Thomas' Patent and Other Prop Irons, Plated Nuts and Rivets, Whiffletree Plates and Bolts,** Safety Strap Yokes, &c., &c., &c.

For the Best Quality of Forged Carriage Irons, buy the Encircled S Make.

SEND FOR PRICE LIST.

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Anvils.
Solid Cast Steel.....₱ lb 14c
Wright's.....₱ lb gold 12½c; over 250 lbs 13c, gold
Armitage's Mouse Hole.....gold 12c
Wilkinson's.....₱ lb gold 11½c
Eagle Anvil Co. ₱ lb 12c.....dis 15 @ 15&5 %

Apple Parers.
Turn Table, Lightning, Reading, Conqueror, Union.....$8·50 ₱ doz
Bay State, Paring, Coring and Slicing.....15 00 } dis
Skeleton " " " .....9 00 } 5 %
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Bay State Peach Parer.....9 00
Lightning " " .....$11 00 @ 11 50
Peach Stoner and Halver.....11 00 @ 11 50
.....7 00

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Snell Mfg. Co.....dis 15 %
Russell Jennings.....dis 10 %
Douglass Mfg. Co., Extra.....dis 25 %
" " No. 1.....dis 25&5 %
" " Hollow Augers.....dis 25 %
Cushman's Expanding Hollow Augers.....dis 20&10 %
Ives'.....dis 25 %
" Hollow Augers.....dis 30 %
" Expansive Augers.....dis 30 %
" " Bits.....dis 25 %
Andrews' Bits.....dis 20 %
Cook's Patent Augers.....dis 30&10 %
" " Bits.....dis 25&10 @ 30&10 %
Shepardson's Double Cut Bits.....dis 20 %
Griswold's Patent.....dis 20 %
Cast Steel Cut Augers.....dis 30&10 %
" Auger Bits.....dis 30&10 %
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Red Jacket.....₱ doz 12 00 @ 12 50
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Chatillon's, Frary's, Morton's.....new list dis 15 %

Bands.
Plated.....add 10 ; dis %
Iron.....dis 15&5 %
Brass (Plated list).....dis 5 %
Oroide.....add 15 ; dis 5 %

Bells.
Hand, Light Brass.....dis 60&10 %
White Metal.....dis 45&10 %
Globe.....dis 20 %
Swiss Hand.....dis 10 %
Abbe's.....dis 10&10 %
Taylor's Patent Door.....net
Western Gong.....net
Brook's Crank.....net list
" Pull.....dis 15 %
Hart Mfg. Co., Crank and Pull.....new list dis 50 %
Cow—Common Wrought.....new list dis 33⅓ %
Western.....new list dis 33⅓ %
Kentucky "Star".....new list dis 20 %
Dodge's Genuine Kentucky.....new list dis 25 %
Yaw's Genuine.....dis 20 %

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Blacksmiths'.....dis 10 %
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Van Sand's.....₱ gross $14 00
Washburn's Patent.....₱ gross 14 00
Merriman's.....add 35 @ 40 %

Blind Staples.
Boardman's Patent, ½ in. and larger.....₱ lb 37½c
" ⅜ in " " 42 c

Bolts.
Cast Iron Barrel, Shutter, &c.....old list dis 50&10 %
Wrought Iron Barrel.....net
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Carriage and Tire, Common.....dis 20 %
" " Norway Iron.....dis 40 %
Star, Philadelphia.....dis 40 %
Eagle, Philadelphia.....dis 40 %
Philadelphia Pattern, P. S. & W.....dis 50&10 %
Carriage and Tire, R. B. & W.....old list dis 50&5 %
Plow, R. B. & W.....dis 30 %
Stove, R. B. & W.....dis 10 %
Union Nut Co.....dis 50&10 %
Machine.....dis 20 @ 25 %

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Snell Mfg. Co., Rice's Patent.....dis 15 %
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Wilson Mfg. Co.....net @ add 5 %
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Bung Hole Borers.
Common and Ring.....dis 20 %
Enterprise Mfg. Co.....dis 20 %
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Butchers' Cleavers.
Bradley's.....dis 15 %
Beatty's.....new list dis 10 %

2	3	4	5	6	7	8
$19·00	$21·50	$24·00	$27·00	$30·00	$33·50	$36·50	$40·00

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0	1	2	3	4	5	6
$25·25	$29·75	$30·25	$38·75	$43·55	$48·50	$54·00

Butts.
Wrought Brass.....new list dis 20 %
Cast Fast Joint, Narrow.....dis 40 %
" " Broad.....dis 40 %
Cast Loose Joint.....dis 50 %
" " Mayer.....dis 40 %
" " Parliament.....dis 40&10 %
Loose Pin.....dis 40&10 %
Wrought Fast Joint, Narrow.....dis 30 %
Wrought Broad.....dis 35 %
" Loose Joint.....dis 35 %
Wrought Table and Back Flaps.....dis 25 %
Cast Butts, Ohio Butt Co.—
Narrow Fast, Drilled and Wire Jointed (old list).....dis 20 %
Broad Fast, Drilled and Wire Jointed.....dis 35 %
Broad, Loose, Drilled and Wire Jointed.....dis 45 %
Silver Tipped.....dis 40 %
Loose Joint, Japanned.....dis 25 %
Loose Joint, Acorn and Silver Tipped.....dis 40 %
Palmer Blind Butts.....dis 30&10 %
Nicholson Blind Butts.....dis 40&10 %
Parker's Blind Butts.....dis 40&10 %
A. S. Parker's.....dis 40&10 %
Clark's Blind Butts.....dis 40&10 %
Clark's Blind Hinges, No. 30.....dis 50&5 %
Seymour's.....dis 40&10 %
Shepard's.....dis 40&10 %
Garretson's.....dis 40&10 %
Standard.....dis 40&10 %
Union Mfg. Co.'s Drilled Fast.....new list dis 35 %
" " Loose.....dis 45 %

Caps—Percussion, per 1000.
G. D.....40c
Ely's E. B.....1-4s, 65½c.; 1-10s, 75c., gold
" Double Waterproof, 1-4s, $1·57½; 1-10s, $1·65c., gold
Colt's.....1-4s, 82½c; 1-10s, 90c., gold

Cartridges.
Metallic.....dis 50 %

Cards.
Horse and Curry.....dis 25&10 %
Cotton.....new list dis 10&10 %
Wool.....new list dis 10&10 %

Casters.
Iron and Wood Wheel Plate.....new list dis 20&10 %
Brass Wheel Plate.....new list dis 20&10 %
Porcelain Wheel Plate.....new list dis 20&10 %

Chain
English Coil.....net gold

₱ lb.	18	9 ⅛	9	8½c	8¼	8c
	3-16	¼	5-16	⅜	7-16	½

Trace, 6¼ to 9 ft.....₱ pair, gold, 65c
Trace, 7 to 9 ft.....₱ pair, gold, 65c
Galvanized Pump Chain.....₱ lb 14c
German Halter Chain.....new list, gold,
German Coil.....new list, gold,
Jack Chain, Iron.....dis 35 @ 40 %
" Brass.....dis 20 @ 25 %

Chalk.
White.....₱ gross, 60c
Red.....₱ gross, 80c
Blue.....₱ gross, 90c
Crayons.....₱ gross, 14c

Cherry Stoners.
"Family".....₱ doz $9·00

Chisels.
Socket Firmers.....dis 60&5 @ 60&10 %
Socket Framing.....dis 60&10 %
Socket Corner.....dis 60&10
Tanged Firmers.....dis 40 %
Butcher's.....$5·50 to £ gold—new list
Newbould's.....$5·50 to £ gold
Spear & Jackson's.....$5·50 to £ gold—new list

Clips, Axle.
Norway or Best.....dis 20 @ 30 %
Superior.....dis 40&5 %
"Star," Superior, Philadelphia.....dis 45&5 %

Coal Shovels.
Iron Handled.....₱ doz, $ 85 @ 1 25
Wooden Handled.....₱ doz, 1 00 @ 2 00

Coal Hods.
Smith, Burns & Co.....dis 35 %

No.	14	15	16	17	18	
Japanned	10·00	9·25	10·50	12·00	13·50	per doz
Galvanized	13·00	14·50	15·50	17·50	19·50	"

Cocks.
Brass Racking.....dis 10&10 %
Lock and Globe.....dis 10&10 %

Coffee Mills.
Board and Box.....dis 15 %
Increase Wilson's.....new list dis 10 %
Selsor's Pat.....$9·50, $10·50—dis 30 %
French Steel.....dis 10 @ 20 %
"Champion".....dis 20 %
Swift's.....dis 20 %

Compasses and Dividers.
Bemis.....dis 15&15 @ 20&5&15 %
Excelsior.....dis 30 %
Peck, Stow & Wilcox.....dis 25 %

Coopers' Tools.
Bradley's.....dis 15 @ 20 %
Chas. E. Little.....dis 15 @ 20 %

Corn Knives and Cutters.
Bradley's.....list net

Crucibles.
Gautier & Co.....₱ No. 5½c

Curry Combs.
Hotchkiss' and Kellogg's, Iron and Brass.....dis 15 %
Fitch's.....dis 15&10 %
Ruggles'.....dis 15 @ 20 %
Rubber.....₱ doz, $9·00—dis 10 %
Schweitzer Mfg. Co.....dis 20 %

Curtain Pins.
Silvered Glass.....dis 40&10 %

Cutlery.
American Table.....
American Pocket.....dis 15 %

Door Springs.
Gray's.....$7·50 per doz—dis 40 %
Torrey's Patent.....$7·50 ₱ doz—dis 40 %
Palmer's Japanned No. 6.....₱ doz $5·00
" Coppered " .....6·00
" Silvered " .....8·00
Challenge.—
Japanned.....₱ doz $4 00 @ 6 00
Bronzed.....₱ doz 5 00 @ 7 00
Nickel Plated.....₱ doz 6 50 @ 9 00
1 Gross lots.....dis 10 %
5 Gross lots.....dis 20 %

Drawing Knives.
.....dis 60 @ 60&10 %
Bradley's.....dis 25 %

Drills.
Ingersoll's Ratchet.....dis 25 %
Moore's Triple Acting Ratchet.....dis 20 %

Egg Beaters.
Monroe's.....₱ doz net $8·25 @ 8·50
Ashley's.....₱ doz net 2·25 @ 3·00
Earle's Patent.....₱ doz net 5·50 @ 6·00
Pratt's Aerating.....dis 10 %
Dover.....₱ doz net $6·00

Emery.
Genuine Chester—Regular Nos.....₱ lb 8c } dis 5 @ 10 %
" Flour and FF.....₱ lb 5c }
Washington Mills—Regular Nos.....₱ lb 8c
" Flour.....₱ lb 5c

Enameled and Tinned Ware.
Kettles.....dis 15 %
Sauce Pans, Glue Pots, &c.....dis 10 %

Faucets.
Cork Lined, Wood.....dis 60 %
Fenn's.....dis 50 %
" Cork Stops.....dis 40 %
Star.....dis 55&10 %
Frary's Patent Petroleum.....dis 10&10 %
Taylor's Pattern " .....dis 20&10 %
Wood and Metallic.....dis 40 %

Files.
Nicholson.....$5 00 to £ currency
Newbould's.....5 50 to £ gold
J. & Riley Carr's.....5 50 to £ gold
" " Rasps.....5 75 to £ gold
Stubs'.....8 50 to £ gold
Butcher's.....5 50 to £ gold
Spear & Jackson's.....5 50 to £ gold
Hargreaves, Smith & Co.'s.....5 50 to £ gold
Jowitt's.....5 25 to £ gold
"Western".....5 00 to £ net
W. K. & C. Peace's "Imperial".....5 25 to £ gold
R. Ibbotson.....5 00 to £ gold
Beam & Murray, "Cyclops".....4 85 to £ gold
Fisher's.....4 75 to £ gold
Goodlad's.....4 00 to £ gold
Moss & Gamble.....5 25 @ 5 50 to £ gold

Fluting Machines.
Acme.....$7 00 each net
Cole.....5 75 each net
Manville, No. 2.....7 00 each net
Knox, with 4-inch Rolls.....5 00 each net
" " 6 " .....6 00 each net
O. K.....6 50 each net
Peerless, 4-inch Rolls.....4 00 each net
" 5 " .....5 00 each net
Excelsior, No. 1.....4 75 each net
" No. 2.....6 50 each net
Diamond.....7 50 each net
Climax 7-inch Rolls.....8 00 each net
" 4½ " .....6 50 each net
Empire.....4 00 each net
Eureka, No. 1, 7-inch Roll.....8 00 each net
" No. 2, 5-inch Roll.....6 00 each net
K. F. M., 4-inch Roll.....5 50 each net
" 6-inch Roll.....6 00 each net
Fairy, Self-Heater.....10 00 each net
National, 5-inch Rolls.....5 00 each net
Ponton Fluter, Bright.....$1 50—dis 25 %
" Galvanized.....2 00—dis 25 %
Geneva Hand Fluter.....$1 25 each net

Fry Pans.
Tinned.....dis 20 %

₱ doz.	$3·00	3·25	3·62	4·00	4·50	5·00	5·50	6·00	7·50
No.	0	1	2	3	4	5	6	7	8

Peck, Stow & Wilcox.....dis 25 %
Smith, Burns & Co., "Excelsior" Polished.....dis 20 %

₱ doz	$3·70	4·00	4·70	5·30	6·00	7·00	8·00	9·00
No.	1	2	3		5	6	7	8

Hammers.
Emmet Hammer Co.....dis 10 %
Maydole's.....new list net
Cheney's.....new list net
Verree.....dis 5 %
Yerks & Plumb.....new advanced list dis 5 @ 10 %
Minot & Co.....dis 15 %

Handles.
Hammer and Hatchet.....dis 10 %
Quakertown, Axe, Pick and Sledge.....dis 10 %
" Hammer and Hatchet.....net
Greensboro', Axe, Pick, Hammer, &c.....dis 10 %
Woolworth Axe, Pick and Sledge.....dis 10 %

Harness Snaps.
Judd's.....dis 30 %
Fitch's.....dis 30 %

Hatchets.
Isaiah Blood.....dis 10 %
Shingling, Nos. 1 2 3.....₱ doz $7 50 8 00 8 50
Claw, " 1 2 3.....₱ doz 8 50 9 00 9 50
Lathing, " 1 2 3.....₱ doz 7 50 8 00 8 50
Hurd's.....net
Shingling, Nos. 1 2 3.....₱ doz 7 25 8 00 8 75
Claw, " 1 2 3.....₱ doz 7 75 8 50 9 25
Lathing, " 1 2 3.....₱ doz 7 50 8 25 9 00
Hurd's.....dis 20 %
Shingling, Nos. 1 2 3.....₱ doz $8 00 8 50 9 00
Claw, " 1 2 3.....₱ doz 9 00 9 50 10 00
Lathing, " 1 2 3.....₱ doz 8 00 8 50 9 00
Newark's Edge Tool Co.'s.....dis 25 %
Shingling, Nos. 1 2 3.....₱ doz $6 50 7 00 7 50
Claw, " 1 2 3.....₱ doz 7 25 7 75 8 25
Lathing, " 1 2 3.....₱ doz 6 50 7 00 7 50
Yerks & Plumb.....dis 10 %
Shingling, Nos. 1 2 3.....₱ doz $7 00 7 50 8 00
Claw, " 1 2 3.....₱ doz 7 50 8 00 8 50
Lathing, " 1 2 3.....₱ doz 7 00 7 50 8 00
Simmon's.....dis 10 @ 15 %
Shingling, Nos. 0 1 2 3....₱ doz $7 50 8 00 8 50 9 00
Claw, " 1 2 3....₱ doz 9 00 9 50 10 00
Lathing, " 1 2 3....₱ doz 8 00 8 50 9 00
Broad, " 1 2 3....₱ doz 9 00 10 00 12 00
" " 4 5 6....₱ doz 14 00 16 00 18 00
" " 7 8....₱ doz 20 00 22 00
Elephant.....dis 20 %
Shingling, Nos. 1 2 3.....₱ doz $8 00 8 50 9 00
Claw, " 1 2 3.....₱ doz 9 00 9 50 10 00
Lathing, " 1 2 3.....₱ doz 8 00 8 50 9 00
J. P. Verree & Co.....dis 5 %
Shingling, Nos. 1 2 3.....₱ doz $7 00 7 50 8 00
Claw, " 1 2 3.....₱ doz 7 50 8 00 8 50
Lathing, " 1 2 3.....₱ doz 7 00 7 50 8 00

Hinges.
Wrought Strap and T.....dis 30&7½ %
Providence Plate.....6 and 8 in. list 11c. } dis 10&5 %
over 8 in. list 9½c. }
Screw Hook and Strap.....8, 10, 12 in. 8¼c } net
14 to 36 in. 7¼c }

Hoes.
Solid Shank, C. S.....₱ doz $8 00—dis 20 @ 25 %
Socket.....₱ doz 9 00—dis 20 @ 25 %
Riveted Eye.....₱ doz 5 00—dis 20 @ 25 %
Grub.....dis 20 %
Planters'—Winsted.....add 10 %
Scovill.....add 33⅓ %
Scovill Pattern (Winsted).....add 20 %

Hooks.
Belt.....dis 50 %
Bench.....₱ doz net $5 00 @ 8 50
Wardrobe, Japanned.....new list dis 10&10 %
Hat and Coat " .....new list dis 15&10 %
Wrought Staples and Hooks and Staples.....dis 60 %
Wrought Hasps and Staples and Hasps, Hooks and Wrought Staples.....dis 60 %
Screw Hooks and Eyes, revised list.....dis 60&10 %

Horse Nails.
Putnam's.

No.	5	6	7	8	9	10
	32c	28c	26c	25c	24c	23c

In lots 2000 lbs. dis. 5 %.
Ausable.

No.	5	6	7	8	9	10
	30c	27c	25c	24c	23c	22c

In lots of 1000 lbs. 5 % disc. net.
Brundage.

No.	5	6	7	8	9	10
	29c	26c	24c	23c	22c	21c

In lots of 500 lbs., dis. 5 %.
American Pressed.

No.	5	6	7	8	9	10
	22c	20c	20c	20c	20c	20c

In lots of 1000 lbs. dis 5 %.
Perkins Finished (ready to drive).

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

In lots of 1000 lbs. dis 5 %.
Buffalo Forged.

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

Globe (Pointed and Polished).

No.	5	6	7	8	9	10
	31c	28c	26c	25c	24c	23c

In lots of 1000 lbs., 5 % discount.

National (Pointed and Polished), Extra Finish.

No.	5	6	7	8	9	10
	30c	27c	25c	24c	23c	22c

In lots of 1000 lbs., dis 5 %.
Vulcan (Blued, pointed, ready to drive).

No.	5	6	7	8	9	10
	33c	30c	28c	27c	26c	25c

In lots of 500 lbs., 5 % discount.
" 1000 lbs 7½ % discount.
New London Horse Nails.

No.	6	7	8	9	10
	27c	25c	24c	23c	22c
G. B.	29c	27c	26c	25c	24c

In lots of 1000 lbs., dis 5 %.
Star Brand.....₱ lb 16c
Morgan.....16c

Horse Shoes.
Burden.....₱ keg, $6 37½
Shoenberger.....₱ keg, 6 37½
R. I. Horse Shoe Co., Perkins Pattern.....₱ keg, 6 37½
" " R. I. Pattern.....₱ keg, 6 87½
Mule Shoes.....₱ keg, 7 37½

Kettles.
Enameled.....dis 15 %
Brass.....₱ lb 55c
In lots of 500 lbs.....₱ lb net 50c

Knives.
Ames' Butcher Knives.....dis 20 %
" Shoe.....dis 15 %
Hay and Straw, "Wadsworth's".....dis 20 %

Knobs.
Base—Common.....net
" Plush Tip.....dis 10 %
" Elastic End.....reduced list dis 10&10 %
Trenton Lock Co.....dis 40 %

Lanterns.
Brady's Patent.....dis 10 %
Ætna.....dis 10 %
Yankee.....dis 10 %
De Beque.....dis 10 %

Locks and Latches.
Cabinet—Eagle.....dis 25 %
Cabinet—Gaylord.....dis 25 %
Trunk.....dis 10 %
Continental.....dis 15 %
Shepardson's.....dis 20 %
Trenton Lock Co.....dis 40 %
Branford.....dis 40 %
Norwich.....dis 40 %

Meat Cutters.
Dixon's (P. S. & W.).....dis 10 %

No.	1	2	3	4
₱ doz.	$14 00	$17 00	$19 00	$30 00

Hales'.....dis 25 %

No.	11	12	13
₱ doz.	$27 00	$33 00	$42 00

Perry's Champion (P. S. & W.).....dis 10 %

No.	200	300	400
₱ doz.	$22 00	$27 00	$40 00

Woodruff's (P. S. & W.).....dis 10 %

No.	100	150
₱ doz.	$15 00	$18 00

American.....dis 25 @ 25&5 %

No.	1	2	2½	3	5
Each	$6 00	$9 00	$14 00	$15 00	$30 00	$75 00

Molasses Gates.
Stebbins' Pattern.....dis 60&10 %
Tinned ends.....dis 40&10 %
Weed's Patent Self-Boring.....dis 15 %
" without Auger Bit.....dis 40 @ 50 %
Patent Self-Measuring.....per doz $42 00—dis. 20 %

Mouse Traps.
Wood Choker.....₱ doz holes, 16 @ 30c

Nails.
10d Cut (Standard).....$4 75

Nuts and Washers.
Nuts, large.....3½c off list
" small.....4½c off list
Washers (as to quality).....5c @ 6c off list

Oil Stones.
Washita No. 1.....₱ lb 22c
" Slips.....₱ lb 44c
Hindostan.....₱ lb 6c dis 10 %
" Slips.....₱ lb 10c dis 10 %

Oilers.
Olmsted's.....dis 25&10 %
Broughton's.....dis 25&5 %
Common Zinc, Brass and Copper.....dis 25 %

Picks.
Washoe R. R. Nos.

₱ doz...	1	2	3	4	5
	$14·00	15·00	16·00	17·00	18·00

Washoe Coal, " ... $8·50 9·00 10·00 11·00 13·00 15·00

Picture Nails and Knobs.
Richards' Patent.....dis 40 @ 40&10 %

Planes.—(See Trade Report.)
Plane Irons.....list net
" Butcher's.....$5 50 to £ gold—new list
" Spear & Jackson's.. 5 50 to £ gold—new list
" Sandusky Tool Co.....list net

Pumps.
Douglas Cistern, etc.....new list dis 25 %
" S. & F.....new list dis 20 %

Rakes.
Cast Steel.....dis 25 %

$8 00	9 00	10 00	11 00
8	10	12	14 teeth.

Razor Straps.
Genuine Emerson (B. F. Badger).....dis 33⅓ %
Hunt's.....dis 25&10 %
Chapman.....dis 10 @ 15 %

Rivets.
Iron and Tinned.....dis 25 %
Copper Rivets and Burrs.....dis 10 %

Rods.
Stair.....new list dis 25 %
American Patent.....dis 25 %

Rope. Manufacturers' List.
Manilla.....½ inch and larger ₱ lb 18c
" .....⅝ inch ₱ lb 18½c
" .....⅜ and 5-16 inch ₱ lb 19c
" Lath Yarn.....₱ lb 19c
" Hay Rope.....₱ lb 19½c
Jute.....₱ lb 12c
Sisal.....½ inch and larger ₱ lb 15½c
" .....⅜ inch ₱ lb 16c
" .....¼ and 5-16 inch ₱ lb 16½c
" Hay Rope.....₱ lb 16c

Rules.
Stanley Rule and Level Co.'s Ivory.....dis 50&10 %
" Boxwood.....dis 6&10 %
Standard Rule Co.'s Boxwood.....dis 60&10 %

Sad Irons.
Sand Paper—dis 7½ @ 10 %
Beader & Adamson's (Flint) 00 to 1½.....$4 50 ₱ ream
" " " 2, 2½ & 3.....5 00 "
Assorted.....4 50
Star.....₱ ream $3 50
Emery.....₱ ream $7 00 @ 12 00
Cowdin Mfg. Co.....dis 7½ @ 10 %
Diamond Flint, 00 to 1½.....per ream $4 50
" " 2, 2½, 3 and assorted.....5 00
" Emery Paper.....per ream $7 00 to 12 00

Sash Locks.
Clark's.....dis 20 %
Ferguson's.....dis 20 @ 25 %
Champion.....₱ gross $13 00 @ $14 00
Norwich.....dis 15 %

Sash Weights.
Solid Eyes.....₱ lb 2¾c

Sausage Fillers.
Perry's (P. S. & W.).....dis 10 %

No.	1	0
₱ doz.	$15 00	$21 00

Saw Rods.
.....dis 10 %

Saws.
Spear & Jackson's.....$4 50 to £ gold
John Spear.....$3 60 to £ gold
Am. Saw Co.....new list
Perforated Cross Cuts, all kinds.....68c ₱ foot
Inserted Tooth.....dis 10 %
All else.....dis 12½ %
Disston's.....dis 12½ %
H. W. Peace's Circulars.....dis 10 %
Other kinds.....dis 10 %
Wm. McNiece's Hand, Cross Cut and Circular.....new list dis 10 %
Lightning.....new list dis 30 %

Scales.
Brown's.....dis 25&5 %
Fairbanks'.....new list dis 15 @ 20 %
Howe's.....dis 15&5 %
Shattuck's Counter and Union.....dis 15 %
National Platform.....dis 25 %
Eureka.....dis 25 %
Scale Beams.....dis 20 %
No. 1 300 to 1200 lbs.....90c ₱ cwt
No. 2 " " .....75c ₱ cwt

Screws.
American list of April 1, 1873.
Flat Head Iron.....dis 47½ %
Round Head Iron.....dis 45 %
Flat Head Brass.....dis 60 %
Round Head Brass.....dis 50 %
Round Head Silver Capped.....new list dis 20 %
Hand Rail.....dis 10 %
Coach or Lag.....dis 25 %
Coach, Patent Gimlet Point.....dis 15 %
Bed.....list net

Scythes.
Blood's German Steel, Grass.....₱ doz $9 00
" Cast " " .....₱ doz 10 00
" Silver " " .....₱ doz 11 00
" German " Grain.....₱ doz 13 00
" Cast " " .....₱ doz 14 00
" Red Rover.....12 00
" Young America.....9 50
" Silver Clipper.....12 63
Scythe Snaths.....dis 20 %

Shears.
Cast Steel.....dis 60&10 %
Conn. Cutlery Co., new brand.....dis 60 %
Rowe's.....dis 50&10 %

Shovels and Spades.
Ames.....list July 1, '70, list net @ dis 2½ %
Rowland.....new list Feb. 8, '73, dis 20 %
Old Colony.....dis 2½ %

Shovels and Tongs.
Iron Head.....list net
Brass Head.....dis 5 %
Polished Steel.....new list dis 15 %

Slates.
Square Frames, Round Cornered, by case.....dis 60&10 %
Less than a case.....dis 60 @ 55 %
Oval Frames, by case.....dis 40 @ 40&10 %
Less than a case.....dis 50 %

Spoons.
Iron.....new advanced list, dis 10 %
By the case.....dis 20 %
Britannia.....dis 40 %
Plated A 1.....dis 20&5 @ 25&5 %
German Silver.....add 10 @ dis 5 %
Tinned (P. S. & W.)—
Teas.....$1·50 ₱ gross, net
Tables.....2·75 " net

Stocks and Dies.
.....dis 15 %

Stove Polish.
Joseph Dixon's.....₱ gross, $6 00 @ 6 25
National.....₱ gross $4 75

Squares.
Steel.....dis 50 %; full cases, dis 50&10 %
Iron.....dis 50 %; full cases, dis 50&10 %
Nickel Plated.....add $2 50 @ $4 00 ₱ doz net
Try Squares and T Bevels.....dis 45&10 %
Star Try Squares and Bevels.....dis 30 %

Tacks.
Full Weight American Iron.....dis 35&7½ %
Half Weight American Iron.....dis 67½&7½ %
Carpet.....dis 7½ %
Brads American Half Weight.....dis 50&7½ %
Finishing Nails.....½ ⅝ ¾ 1 1¼ in. and over
₱ lb.....25c 20c 18c 14c 13c dis 7½ %
Trunk and Clout.....½ ⅝ ¾ 1 1¼ in. and over
₱ lb.....25c 20c 18c 14c 13c dis 7½ %
Copper Tacks.....₱ lb 56c—dis 7½ %
Iron Shoe Nails, ₱ lb 4-8 and longer, 10½c; 3⅜-8.
11c.....dis 7½ %
Double Pointed.....new list dis 33⅓ %

Tapes, Measuring.
American Flask and Cap Co.....dis 10&10 %
Eddy's.....dis 10&10 %

Toe Calks.
.....₱ lb 13c net

Tobacco Cutters.
Champion.....dis 20 %
Peck, Stow & Wilcox.....dis 10 %

Tinners' Tools and Machines.
P. S. & W.....list net

Traps.
Newhouse.....dis 20 %
Hotchkiss.....dis 20 %
Peck, Stow & Wilcox.....dis 30 %
Blake's Patent.....dis 15 @ 20 %

Vises.
Trenton Vises, Solid Box.
30 to 110 lbs.....17c
111 to 160 lbs.....18c
160 and over.....21½c
Peter Wright's.....₱ lb 15½c. gold
Wilson's Solid Box.....dis 10 @ 15 %
30 to 160 lbs.....18c
160 and upward.....21c
Backus & Union, Parallel.....dis 25 %
Buffalo, Parallel.....new list dis 15 %
Fisher & Norris' Double Screw Parallel.....dis 15 @ 15&5 %

Wire.
Bright and Annealed.....No 0 @ 18 dis 30 @ 32½ %
" " " 19 @ 26 dis 40 @ 42½ %
" " " 27 @ 36 dis 45 @ 47½ %
Coppered.....Nos. 0 @ 18 dis 20 @ 25 %
Galvanized, Nos. 6 to 12.....dis 35 @ 40 %
Galvanized, Nos. 13 to 18.....dis 40 @ 45
Tinned.....dis 15 @ 20 %
Cast Steel.....5 @ 10 %
Tinned Broom Wire.....dis 20 @ 25 %
Galvanized Telegraph, Nos. 8 and 9.....₱ lb 10c @ 11c
" " " 10 and 11.....₱ lb 11c @ 12c
" " " 12.....₱ lb 11½c @ 12½c
Annealed Fence, Nos. 8 and 9.....dis 30 @ 32½ %
" Grape, " 10 to 14.....dis 30 @ 32½ %
Fence Staples.....₱ lb 9¼ @ 10c
Stubs' Steel Wire.....$7 00 to lb gold

Wrenches.
American Adjustable.....dis 45 %
Baxter's Adjustable "S".....dis 20 %
" Diagonal.....dis 20 %
Collin's & Co.'s.....new dis list 30 %
Coes' Genuine.....dis 30&10 %
" Pattern (Wrought).....dis 50 %
" " " (Malleable).....dis 50&10 %
Lindsay's Patent.....dis 25 %
Taft's Pattern.....dis 65&10 %
Davis' Patent Duplex.....dis 40 %

METALS.

IRON.—DUTY: Bars, 1 to 1½ cents per lb., Sheet, Band, Hoop and Scroll, 1¾ to 1¾ cents per lb. Provided, that none of the above Iron shall pay a less rate of duty than 35 per cent. Pig, $7 per ton; Polished Sheets, 3 cents per lb.; Wrought Scrap, $8 per ton; Cast Scrap, $6 per ton. All subject to a reduction of 10 per cent. Railroad, 70 cents per 100 lbs. Boiler and Plate, 1½ cents per lb.

Pig Iron—AMERICAN.

Foundry No. 1	₱ ton,	$45 00 @
Foundry No. 2	"	36 00 @ 38 00
Gray Forge	"	32 00 @ 34 00
White and Mottled	"	28 00 @ 29 00
SCOTCH.		
Gartsherrie	"	47 75 @ 48 00
Coltness	"	50 00 @
Glengarnock	"	45 00 @ 46 00
Eglinton	"	43 00 @ 43 50

Bar Iron.
Am. Refined, at mill.....₱ lb 3·8 @

Rails.
Welsh, gold.....₱ ton, 65 00 @ 68 00
American, at works, currency....." 75 00 @ 77 50
Old Rails, currency....." 45 00 @ 46 00

Scrap.
Wrought Scrap, from yard, nominally " 45 00 @

Bar Iron from Store.
Common Iron.
⅜ to 2 in. round and square.....₱ ton, $ 82 50
⅝x9-16 in " " ....." 87 50
½ in. " " ....." 90 00
2¼ to 3 in. " " ....." 87 50
1 to 6 in. wide x ⅜ and 1 in. thick....." 82 50
1¼ to 6 in wide x ¼ & 5-16 in. thick....." 87 50
1 and 1¼ in. x ⅛ and 5-16....." 90 00
Swedish Iron.
1¼x⅜ and ½....." 185 00
1¼x⅜ to ⅝, and ⅜ square....." 180 00
1⅜ to 5x⅜ to ⅝ and ⅜ to 2-in. square....." 175 00
to 12x⅝ and ½....."
Refined Iron.
⅜ to 2 in. round and square....." 87 50
1 to 6 in. wide x ⅜ to 1 thick....." 87 50
1¼ to 6 in. wide x ¼ and 5-16 thick....." 92 50
1 and 1¼ x ¼ and 5-16....." 97 50
Large Rounds.
2½ to 2¾, round and square....." 97 50
3, 3¼ and 3½ in....." 102 50
3¾ and 4 in....." 112 50
Rods—⅜ and 11-16, round and square....." 92 50
½ and 9-16, " " ....." 97 50
7-16, " " ....." 100 00
⅝, " " ....." 105 00
5-16, " " ....." 110 00
¾, " " ....." 115 00
⅞-16, " " ....." 135 00
Band Iron.
1 to 6 in. x 3-16 to No. 12....." 105 00
Horse Shoe Iron.
⅜ and ⅞ x ⅜, to ½....." } 117 60
1 x ⅜, to ⅝....." }
Ovals, Half Ovals and Half Rounds.
⅜ to 1 in.....₱ ton, $112 50
⅜ and 11-16....." 117

CHARCOAL TIN PLATE.

I C 10x14, Prime Charcoal	12·50
12x12, "	14·00
14x20, "	14·25
I X 10x14, "	15·75
12x12, "	16·25
14x20, "	16·75
For each additional X add	2·25

COKE TIN PLATE.

	Best.	2d Quality.	Ordinary
I C 10x14	$12·75	$11·75	10·50 @ $11·00
I C 12x12	13·00	12·00	
I C 14x20	13·50	12·75	

TERNE PLATE.

	Prime Char.	2d qual.	Coke.
I C 14x20	$12·25	11·50 @ 11·75	10·50 @ 11·25
I X 14x20	14·00		

ZINC.—DUTY: 1½c or Block, $1 50 per 100 lbs. Sheet, 2½c. ₩ lb. All subject to a reduction of 10 per cent.

Sheet, cask	10½c
" open	11c

Paper Stock, Old Metals, &c.

(*Dealers' Selling Prices.*)

Canvas linen	6 @ 6¼
" cotton, No. 1	7¼ @ 7½
" " No. 2	4
White linen rags, No. 1	7 @ 7¾
" " No. 2	4¾ @ 5
Colored	3 @ 3½
Mixed woolens	2 @ 3
Soft woolens	6½ @ 7
Gunny bagging	1½ @ 1¾
Jute Butts	1⅝ @ 1¾
Kentucky bagging	3½ @ 3¾
Book stock	4½ @ 4¾
Waste paper and scraps	2½ @ 3
Rope cuttings	1¾ @ 3
Kentucky Bale rope	4 @ 4½
Oakum junk, No. 1	5½ @ 5½
" No. 2	4½ @ 4¾
Grass rope	4¾ @ 4½
Tarred Snaking	1¾ @ 2

Old Metal.

Copper	27 @ 28
Yellow metal	18 @
Brass	18 @ 20
Heavy Composition	21 @ 23
Old lead, solid	6½ @ 7
Tea lead	5½
Wrought iron	1¾ @ 2
Sheet iron	1 @
Cast iron	1 @ 1¼
Machinery iron	1¾ @ 2
Zinc	5½
Pewter, No. 1	26 @ 27
" No. 2	10 @ 12
Spelter	7

Paints, Oils, etc.

Paints.

Black, lamp—Coach Painters, ₩ lb	20c
" " Ordinary	6c
" Ivory Drop, fair	15c
" best	26c
Black Paint, in oil, kegs, 8c.; asst'd cans, 11	c
Blue, Prussian, fair to best	50 @ 75c
" " " in oil	35 @ 65c
" Chinese, dry	33c
" Ultamarine	25 @ 30c
Brown, Spanish	1½c
" Van Dyke	9c
Carmine, 40	$12
Green, Chrome	15 @ 20c
" " in oil	18 @ 25c
" Paris, good, 35c; best,	40c
" " in oil, " 30c; "	45c
Mineral Paints	1¼ @ 4c
Orange Mineral	14½c
Red Lead, American	9¼c
" " English	10½c
" Venetian (N. C.) dry	2¾c
" " in oil, asst'd cans, 11c; kegs,	8½c
" Indian, dry	10c
Rose Pink	13c
Sienna, American, Raw	4c
" Burnt	4½c
" " in oil	16 @ 20c
" Raw "	15 @ 25c
Umber, Burnt	4 @ 8c
" " in oil	16 @ 21c
" Raw	3½ @ 7½c
" " in oil	16 @ 22c
Vermillion, Chinese	$1 47
" English	1 45
" Trieste	1 58
" American, Common	23c
White Lead, American, pure dry	11½c
" " " in oil	12 c
White, Paris, English, prime, in bbls.	2½ @ 2¾c
Yellow Ochre French	2½ @ 2¾c
" " in oil, asst'd cans, 11c; kegs,	8½c
" Vermont, in casks	1½c
Chrome	17 @ 21c
" in oil	18 @ 22c
Zinc White, American No. 1 dry	9c
" " 1, in oil	11c
" French (Paris)	11½c
" " in oil	12½c

Oils.

Linseed Raw, ₩ gal. casks,	93c; bbls. 91c
" Boiled, "	98c. " 96c.
Whale, Crude	"
" Bleached Winter	"
Sperm, Crude	"
" Winter unbleached	"
" " Bleached	" 1·80
Seal, Extra Refined	" 87½c
Lard, Pure Winter	" 80c
" Spring	" 73c
Cotton Seed, Crude	" 58c
" Southern Yellow	" 65c
" White	" 75c
Neatsfoot, Winter	$1·10 @ $1·35
Natural Lubricating	bbls, 45c

Sundries.

Asphaltum	9c
Bedzine, ₩ gal.	17c
Chalk	1½c
" Block	
Dryer, Patent, Am'n, asst'd cans, 10½c.; kegs,	9c
" " English, " 11c.; "	9c
Flocks	
Frostings	50c
Glue, White	33 @ 45c
" Sheet	30c
Glaziers' Points, Zinc	9c
Gums, Copal	36c
" Damar	25c
" Shellac, English	35c
" " dark	46c
Litnarge	10c
Pumice Stone, selected Lumps	4 @ 6c
" powdered	4c
Putty in bladders	3½c
" in bulk	3c
Rotton Stone, soft, English	8c
Spirits Turpentine	44
Whiting, Spanish	1¼c

Glass.

French Window—1st, 2d, 3d, and 4th qualities. Per box of 50 feet.

SINGLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$10·75	$9·75	$9·00	$8·25
11 x 14 & 12 x 13	11·50	10·25	9·75	8·75
10 x 16 to 14 x 26	12·50	11·50	10·25	9·00
15 x 22	13·25	12·00	10·75	9·50
15 x 26 to 20 x 30	15·75	14·00	12·00	10·25
22 x 30 to 24 x 30	19·75	16·75	13·50	
26 x 28 to 24 x 36	20·25	17·50	14·00	
26 x 36 to 26 x 44	22·75	20·25	15·50	
28 x 44 to 30 x 50	24·00	21·50	16·75	
30 x 52 to 30 x 54	27·25	24·00	18·75	
30 x 56 to 34 x 56	29·50	26·25	22·00	
34 x 58 to 34 x 60	31·50	29·50	25·00	
36 x 60 to 40 x 60	37·00	32·50	29·50	

DOUBLE.

SIZES.	I.	II.	III.	IV.
6 x 8 to 10 x 15	$16·00	$14·00	$13·50	$12·50
11 x 14 & 12 x 13	17·25	15·50	14·75	13·25
10 x 16 to 14 x 26	18·75	17·25	15·50	13·50
15 x 22	20·00	18·00	16·25	14·25
15 x 26 to 20 x 30	24·00	21·00	18·00	15·50
22 x 30 to 24 x 30	30·00	25·25	20·25	
26 x 28 to 24 x 36	31·00	26·50	21·00	
26 x 36 to 26 x 44	34·00	30·50	22·25	
28 x 44 to 30 x 50	36·00	32·25	25·25	
30 x 52 to 30 x 54	41·00	36·00	28·25	
30 x 56 to 34 x 56	45·00	39·50	33·00	
34 x 58 to 34 x 60	48·00	45·00	37·50	
36 x 60 to 40 x 60	55·00	49·00	45·00	

Sizes above—$12 ₩ box extra for every five inches. Discount to the trade 60 %; 60&10 % for large lots.

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Importers of and Dealers in

Window Glass,

FRENCH PICTURE

And Car Glass, etc.

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L. COES & CO.'S GENUINE SCREW WRENCHES.
NEW LONDON HORSE NAIL CO.
WHEELER, MADDEN & CLEMSON.
WHEELER, CLEMSON & CO., FILES.
AMOSKEAG AXE CO.
TUTTLE MANUFACTUING CO.
EMPIRE MILLS TWINES.
FRENCH, SWIFT & CO.'S AUGERS & BITTS.
AUBURN TOOL CO.'S PLANES.
WINSTED HOE CO.'S PLANTERS HOES AND TOE CALKS.
WITHERBY TOOL CO.'S CHISELS, DRAWING KNIVES AND BORING MACHINES.
OHIO BUTT CO.
STEPHENS & CO.'S RULES.
FISHER & NORRIS, EAGLE ANVILS,
BOSTON BELTING CO., RUBBER GOODS.

OHIO BUTT COMPANY,

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MANUFACTURERS OF

CAST BUTT HINGES,

Drilled and Wire Jointed, Fast and Loose, Loose Pin Reversible, Plain, Japanned, and Japanned with Silver Acorns. Loose Joint Japanned, and the same with Japanned or Silver Acorns.

We have appointed

HORACE DURRIE,

No. 97 Chambers St., New York,

Our only Agent in NEW YORK, BOSTON, PHILADELPHIA and BALTIMORE, for the sale of our goods, and he is authorized to sell at our lowest factory rates.

Ohio Butt Co.

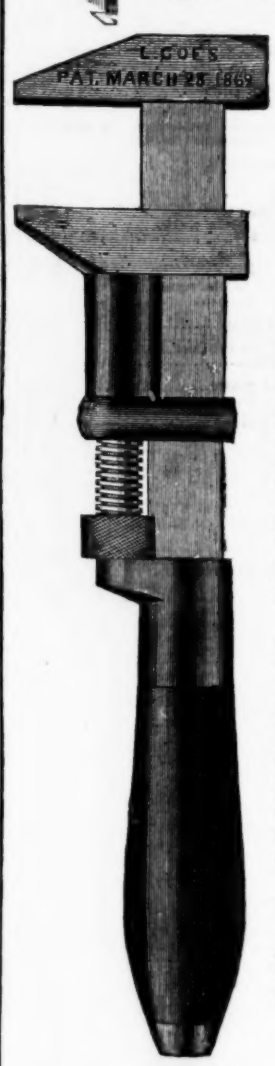
L. COES & CO.,

Manufacturers of

L. COES' Genuine Improved PATENT SCREW

WRENCHES,

Worcester, Mass.



Our Mr. L. Coes, formerly senior member of the firm of L. & A. G. Coes, established in 1839, is the Original Inventor of the Screw Wrench, and has, by making the bar *wider*, where the strain comes most severe, and screwing a nut up firmly against four *square* shoulders inside the ferrule, thereby *effectually* preventing the ferrule from being thrust back into the handle or getting loose, and making a larger screw than in the old wrench, fully succeeded in making a 12 inch wrench stronger than a 15 inch made in the usual manner. All sizes are made in this way, and are undoubtedly the strongest and best finished Screw Wrenches in the market.

There are *Imitations* of our goods offered for sale, that, without question, infringe on our Patents.

We hold Patents bearing date Nov. 10th, 1863 (re-issued June 1st, 1869), June 26th 1866, March 23d, 1869 (re-issued April 19th, 1870, and May 14th, 1872), which fully cover all our improvements. One of the above cuts represents a sectional view, showing the nut under the ferrule, and the strengthened bar, that part being covered by the jaw, as seen in the cut of wrench complete. None genuine unless stamped

"L. COES & CO"

Warehouse, 97 Chambers and 81 Reade Streets, New York.

HORACE DURRIE, Agent.

Parties ordering from the New England States can order direct from the manufacturers

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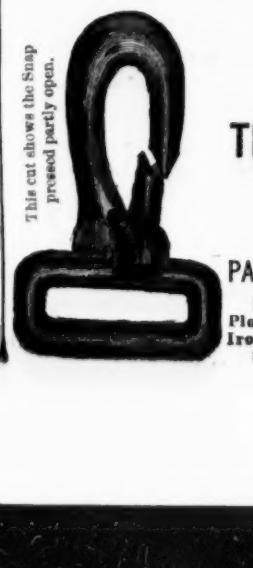
Worcester, Mass.



This cut shows the Snap pressed partly open.

MIDDLETOWN TOOL CO.,

MIDDLETOWN, CONN.,

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The Celebrated "Baldwin" Plane Iron,

HENSHAW'S PATENT HARNESS SNAPS

GERMAN HARNESS SNAPS,

PAT. GAFF TOP-SAIL SELF-MOUSING SHIP HOOKS

Plow, Fillettster & Dado Stops of all kinds. Set Screws for Plows, Bench Plane Starts, &c. Patent Washer Cutters. Plan Iron Screws to order of any size.

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Improved Stationary Engines.

Always on hand assortment of sizes from 10 to 200 horse power. Second-hand engines taken in exchange when desired.

Climax Turbine Water Wheels.

Assortment of sizes always on hand.

Pulleys, Shafting, Gearing and General Machinery.

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WHITEHILL, SMITH & HAMPSON,

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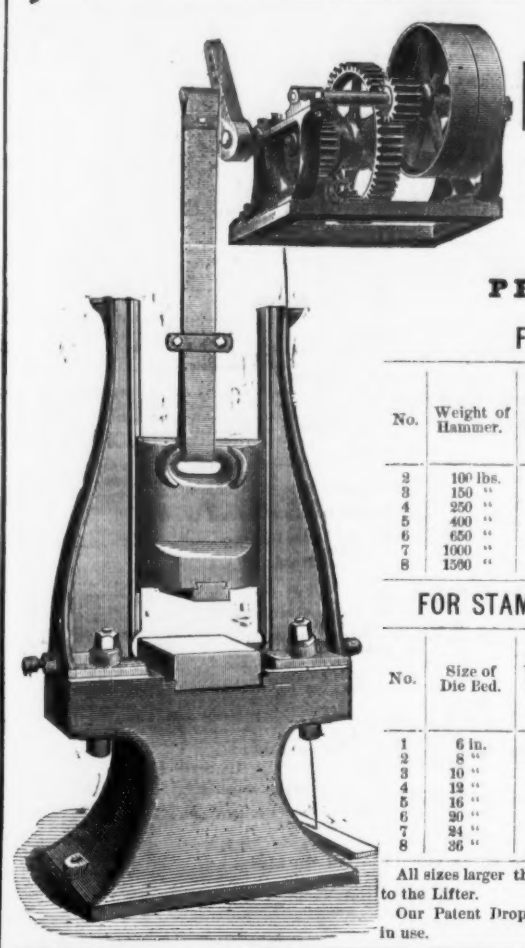


Peck's Patent

Drop Press

MILO PECK & CO.

SOLE MANUFACTURERS.

NEW HAVEN, CONN

PRICE LIST.

FOR FORGING.

No.	Weight of Hammer.	Distance between Uprights.	Lift of Hammer.	Price Complete.
2	100 lbs.	8 in.	24 in.	$ 330 00
3	150 "	10 "	30 "	467 00
4	250 "	12 "	30 "	750 00
5	400 "	16 "	30 "	900 00
6	650 "	16 "	30 "	1200 00
7	1000 "	16 "	30 "	1800 00
8	1500 "	16 "	30 "	2500 00

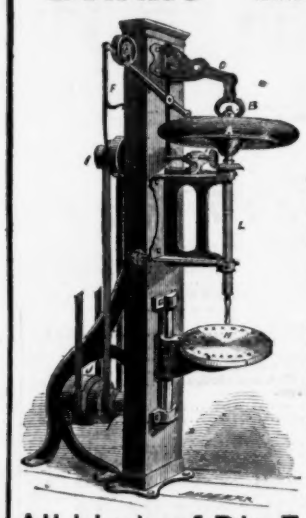
FOR STAMPING SHEET METALS.

No.	Size of Die Bed.	Weight of Hammer.	Price of Drop without Lifter.	Price of Lifter.
1	6 in.	50 lbs.	$ 137 50	$ 82 50
2	8 "	100 "	212 50	137 50
3	10 "	150 "	300 00	220 00
4	12 "	250 "	400 00	340 00
5	16 "	400 "	550 00	430 00
6	20 "	650 "	750 00	530 00
7	24 "	1000 "	1280 00	620 00
8	36 "	1500 "	1850 00	850 00

All sizes larger than No. 3 have Wrought Iron Cranks to the Lifter.

Our Patent Drop Lifter can be applied to any Drop in use.

Biddle Manufacturing Co.,



FINE TOOLS AND Hardware Specialties.

We call the attention of **Carriage Makers, Machinists, Iron Railing Manufacturers, Blacksmiths,** and all others interested in **Drilling, Punching or Cutting Iron,** to our

Improved Drill Press, Shear and Punch,

feeling assured that upon examination their merits must be apparent to every one, from the fact that they possess the essential characteristics of strength, power and cheapness, in a high degree.

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We are also prepared to furnish light work of any description and in any quantity to order.

All kinds of Die Forgings promptly attended to.

OFFICE & WAREROOMS, 78 Chambers Street, New York.

Sole Agents for the Pacific Coast, CONROY, O'CONNOR & CO., San Francisco, Cal.

Tucker's Alarm TILLS,

FOR SALE BY

RUSSELL & ERWIN MFG. CO., New York,
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JOHN NAZRO & CO., Milwaukee,
A. F. Shapleigh & Co., and E. C. Simmons & Co., St. Louis.

IMPROVED BOLT MACHINERY.

BOLT HEADER,

That will head 10,000 per day.

Single & Double Head BOLT CUTTERS,

That will cut from 5000 to 10,000 per day.

Bolt Pointers, Tapping Lathes, Tire Blank and Rivet Headers, Engine Lathes, &c.

Manufactured by

THE

Chapin Machine Co.,

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Successors to EDWARD P. HAMPSON,

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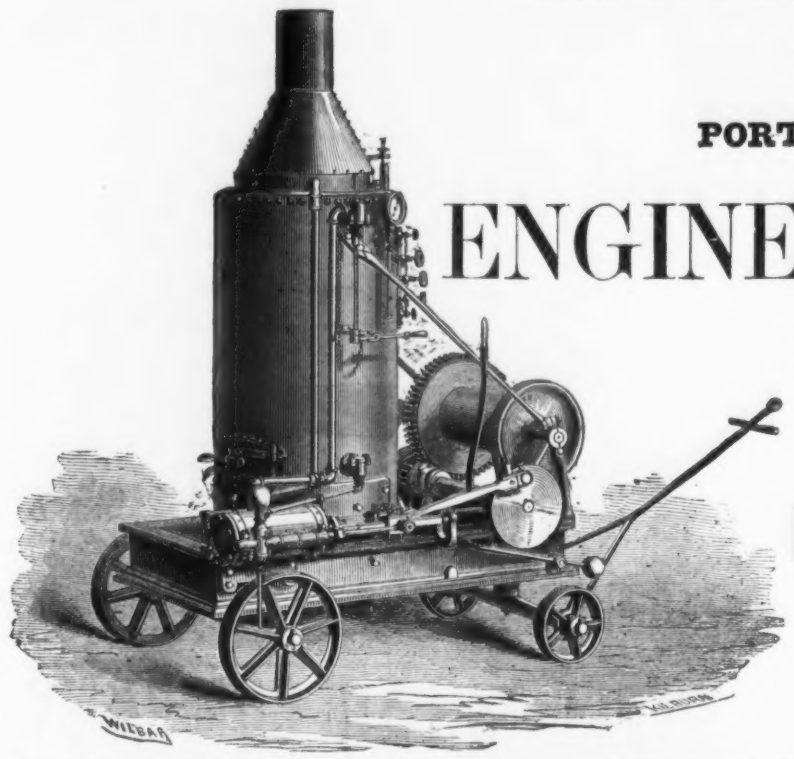

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SAW AND GRIST MILLS.

WATER WHEELS,

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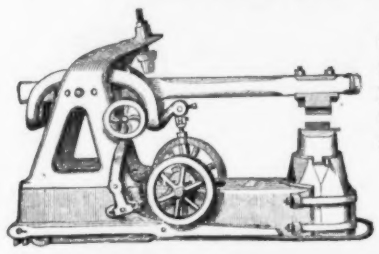

This Hammer has many valuable improvements made useful in the device for cushioning the blow, thereby relieving all the working parts from that jar and concussion which is the destroying element of other Helve Hammers. It is made Adjustable in Line of Action, Length of Stroke, Rapidity of Motion, and Weight of Blow, all of which are controlled at the will of the operator. They have *Larger Capacity, Cost Less,* are more *Durable,* take up *Less Room,* do *More* and *Better Work* at *Less Expense* for Power, than any other Hammer in use. We guarantee them fully as recommended. For particular address

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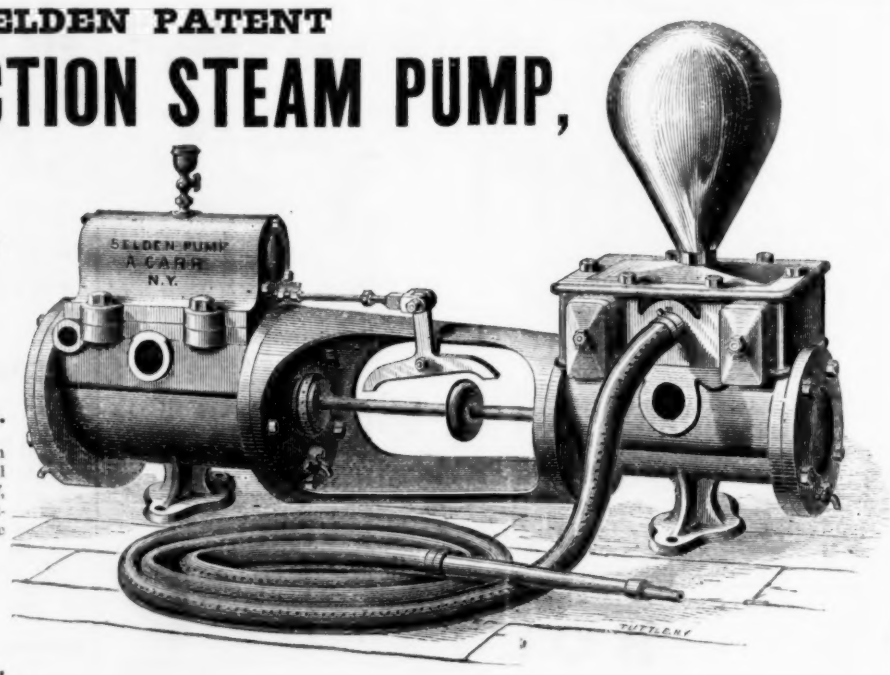
DIRECT ACTION STEAM PUMP,

Patented August 2nd and December 20th, 1870.

Tank Pump, with Boiler Feed Attachment.

For Boiler Feeders,
For Water Works,
For Fire Pumps,
For Mines, etc., etc.



And for all purposes for which Steam Pumps can be used. Sold under full guarantee. Money will be returned if, from any cause, they should prove unsatisfactory. Send for Circular and Price List, fully describing them, to

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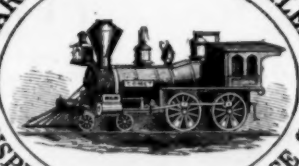
HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.



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JOHN T. LEWIS & BROS. WARRANTED PURE WHITE LEAD. PHILADA.

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MANUFACTURERS OF
PURE WHITE LEAD, RED LEAD, Litharge, Orange Mineral, Linseed Oil
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BROOKLYN WHITE LEAD CO., INCORPORATED 1825
SUPERIOR PURITY, DURABILITY AND COLOR
ADDITIONAL TRADE MARK.
We caution consumers against the numerous spurious brands, in imitation of ours, of adulterated and greatly inferior qualities—which are sold as our LEAD.
$50 Reward for detection of counterfeits.
WHITE LEAD CO. PREMIUM LEAD WARRANTED PURE
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White Lead, &c.

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Manufacturers of the well known Brand of
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Also Manufacturers of
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AND FLOOR OIL CLOTHS,
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TRADE MARK.
The Atlantic White Lead and Linseed Oil Company,
MANUFACTURERS OF
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Cornell Lead Co.,
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S. G. CORNELL & SON WARRANTED PERFECTLY PURE WHITE LEAD BUFFALO, N.Y.

TRADE MARK.
Manufacturers
WHITE LEAD Dry and in Oil,
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THE UNION WHITE LEAD MANUFACTURING COMPANY. PURE

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MANUFACTURERS OF
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Orange Mineral.

Schweitzer Mfg. Co.,
57 Reade Street, New York.

CONTINENTAL LOCKS,

Made of Wrought Iron or Brass, very superior in quality, and only an auger used in mortising.

EXCELSIOR PAD LOCKS,
" COMPASSES,
" DIVIDERS,

ALL WITH

STUBS' STEEL POINTS,

Best and Cheapest Goods in the market. Sole Agents for the United States for

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NOBLE MFG. CO., Tools, Ship Augers, &c.
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We also make a superior
AXE. { *"Queen of the Forest,"* *"Wood Chopper's Pride,"* &c.
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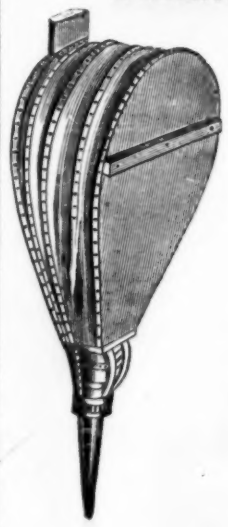
General dealers in
FOREIGN & DOMESTIC HARDWARE.

NEWCOMB BRO'S SONS,

Manufacturers of

Smiths', Moulders' and Hand



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Bowden's Patent

TRIPLE-ACTION

Bellows.

These Bellows are superior to all others now in use.

For further particulars send for descriptive circular and price list.

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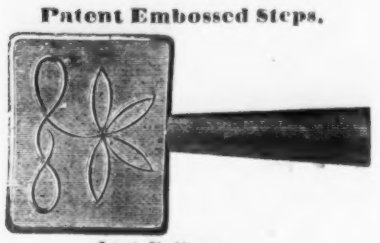
Canal Street, East Broadway and South Street Cars cross Montgomery St

H. D. SMITH & CO., PLANTSVILLE, CONN.

Patent Embossed Steps.

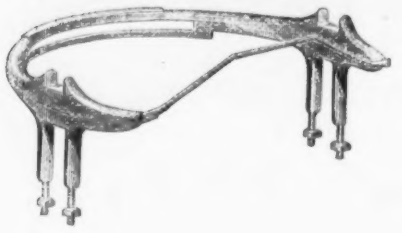


Leaf Pattern

King Bolt Yokes.

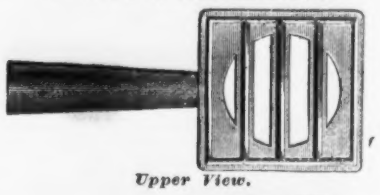
Established 1850.

No. 6 Fifth Wheels.



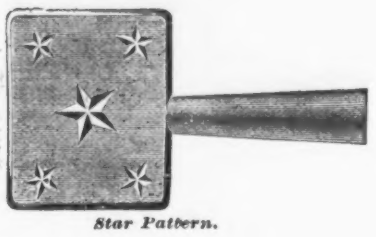
1871 Pattern Shaft Couplings.

Patent Cross Bar Steps.



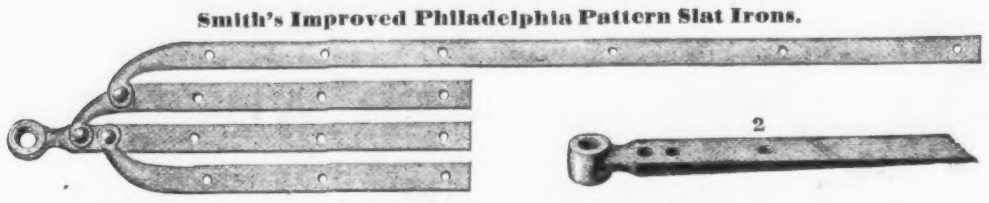
Upper View.

Lower View.

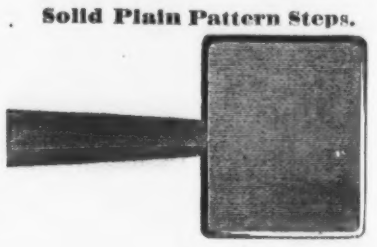


Star Pattern.

Smith's Improved Philadelphia Pattern Slat Irons.



Solid Plain Pattern Steps.



MANUFACTURERS OF A LARGE VARIETY OF FIRST-CLASS

FORGED CARRIAGE IRONS.

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FORT PLAIN SPRING & AXLE WORKS,

CLARK, SMITH & CO.,

Green Jacket Axles. **FORT PLAIN, N. Y.** Fine Carriage Springs.

MANUFACTURERS OF

English and Swedes Steel Springs, and Iron and Steel Axles.

Execute orders promptly for

Black, Bright, Tempered and Oil Tempered Springs,

of any Pattern or Style. Also for **AXLES of any description, from a COMMON LOOSE COLLAR to the FINEST OF STEEL.**

Our facilities for manufacturing are very extensive, and with our recent additions of new and improved machinery, we defy competition.

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CARRIAGE BOLTS.

Buy the Best.

Clark's Patent Carriage Bolt.

Best Bolt manufactured for all kinds of agricultural machinery. Will not split the wood, and can not turn in its place.

MANUFACTURED BY

CLARK BROS. & CO., Milldale, Conn.

Also Manufacturers of

Plow and Machine Bolts, Coach Screws, Nuts, Washers, Tire Blanks, Rivets, &c

Send for New Illustrated Price List, just completed.

R. M. GREEN,

100 Chambers Street, NEW YORK.

Hardware Manufacturers' Agent.

REPRESENT:

BATCHELLER MFG. CO., Cast Steel Forks, Rakes, &c.
VERMONT SNATH CO., Snaths.
H. C. COLE, Ox Bows.
NORTH CAROLINA HANDLE CO., Axe and Pick Handles.
EXCELSIOR MFG. CO., Carriage Rims, Hubs and Spokes, Wood Hay Rakes.
VERMONT MFG. CO., Hay, Manure and Shovel Handles. All kinds of Ash, and Hickory Timber Sawed and Turned to order.

Breast Hold-Back Co.

210 & 212 First Street, TROY, N. Y.

Sole Manufacturers of

COVERT'S PATENT METALLIC BREAST HOLD-BACK.

Made of the best Malleable Iron. The Snap is a new invention, and superior to any yet introduced. The spring is encased in the hollow shank of the snap, preventing dirt from getting to it, and without danger of being broken or disarranged. This article has been in use five years by Farmers, Teamsters, Stage Proprietors and Horse Railroad Superintendents.

It gives good satisfaction. It is cheaper and more durable than anything of the kind in use. For sale by the Hardware Trade.

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Iron & Brass Wood Screws.

Full assortment constantly on hand.

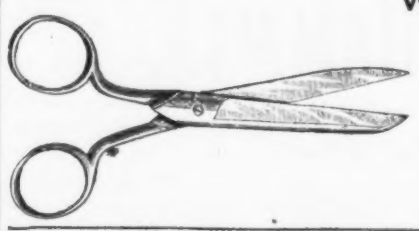
ALFRED FIELD & CO.,

Importers,

47 John, and 5 Dutch Streets, N. Y.

UNITED STATES STEEL SHEAR COMPANY,

WEST MERIDEN, CONN.,



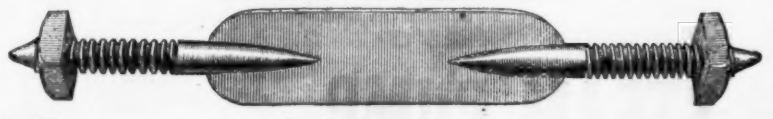
The Only Manufacturers of

SOLID STEEL SHEARS

in the United States.

Phila. Carriage Bolt Works,

Established 1855.



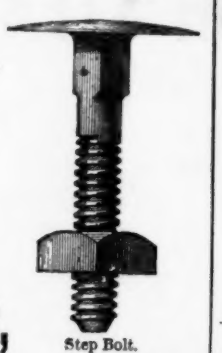
Hand-made Axle Clip.

Carriage Bolt.

T. SKELLY

MANUFACTURER OF FINEST QUALITY OF

NORWAY IRON



Step Bolt.

CARRIAGE & TIRE BOLTS,

Hand Made Axle Clips,

Skelly's Improved T-Head & Whiffletree Bolts,

Cone, Cheese, Square and Diamond Head

BOLTS,

And all the Different Varieties Used by Makers of Fine Carriages,

Pointed Tire Bolt.

Elliptic Head Perch Bolt.

TWENTY-FOURTH ST., BELOW CALLOWHILL,

PHILADELPHIA, PA.

EVERY BOLT AND NUT WARRANTED TRUE TO SIZE AND FIT

Skelly's New Style Improved T Head or Shaft Bolt.

Cone Head Bolt.

HAYDEN LETCHWORTH & SMITH.

AUBURN, N. Y.

MANUFACTURERS OF FORGED NORWAY IRON

Carriage Hardware

HAMES and

Saddlery Hardware.

CARRIAGE MATERIALS,

AXLES | Blacksmiths' Supplies, Bolts, Woodwork, TRIMMINGS, &c. Iron & Steel. HORSE SHOES | SPRINGS

Manufactured and sold by

GUY C. HOTCHKISS & FIELD

85 First Street, Brooklyn, E. D.

And 527 Hudson St., New York.

H. M. WENTWORTH & CO.,

Manufacturers of

Carriage Axles & Springs,

BEST SWEDES STEEL,

Sword Tempered, and

Common Patent Tempered SPRINGS

Of every description, made to order.

Dam No. 3, Water St., Gardiner Me.

Send for Price List.

H. M. Wentworth. F. A. Plaisted.

David Wentworth.

THE

Philadelphia Star Bolt Works.

Carriage and Tire Bolts,

Axle Clips,

Blank Bolts, &c.

Trade Mark.

Square Head Bolts,

Wood Screws.

Plow Bolts, &c.

TOWNSEND, WILSON & HUBBARD,

2301 Cherry Street, PHILADELPHIA,

MANUFACTURERS OF THE CELEBRATED

"STAR" Brand of Axle Clips.

OFFICE AND WORKS, Cor. 2nd & Diamond Sts.

MACHINERY FOR THE MANUFACTURING OF HUBS & SPOKES.

J. GLEASON

PHILADELPHIA, PA.

PHILADELPHIA.

(Corrected weekly by Lloyd, Supplee & Walton).

Terms, 30 days. For 60 or 90 days, interest added at 10 per cent. per annum.

Anvils.—Sold Cast Steel....₱ ℔ 12½c
Peter Wright's....₱ ℔, gold, 13c @ 12½c
Wilkinson's....11½c
Eagle....₱ ℔ 12 cents, currency—dis 10 @ 15 %

Apple Parers.—Reading Improved....per doz $8 50
Victor, Improved.... " 8 25
Union, " .... " 8 00
Turn Table, " .... " 8 50
Discount for 25 dozen lots.... " 50c

Axes.—Mann's Light....Per doz. $13 00 @ 14 00
Hunt's Light.... " 14 00 @ 14 50
Red Indian, all sizes.... " 12 50 @ 13 00
Red Chieftain, all sizes.... " 13 00 @ 13 50
Crown Prince.... " 13 50 @ 14 00

Augers and Auger Bits.—Pierce's Pat. Twist Bits....dis 25 %
Bates' & Ives' Bits....dis 25 @ 30 %
Douglass' Bits....dis 25 @ 30 %
Cook's Bits....dis30 @ 30&10 %
Bonney's Pat. Hollow Augers....dis 25 %
Russell Jennings' Bits....dis 10 %
Bates' & Ives Nut Augers....dis 20&10 %
Douglass Nut Augers....dis 30 %
Watrous' Ship Augers....dis 10 %

Balances.—Landers, Frary & Clark's....dis 10 @ 15 %
Chattillon's....dis 10 @ 15 %
Morton's....dis 10 @ 15 %
Common Spring, with Hook....₱ doz $1 38 @ 2 00

Bells.—Bevin Bros. Mfg. Co. Hand Bells....dis 50&10 %
" Extra Light Hand Bells....dis 50&10 %
Other makers light....dis 55 @ 60 %
Connell's Door Bells....old list net
Western and Kentucky....dis 50 %

Boring Machines.—Bates' Mfg. Co., complete with augers....dis 10 @ 15 %
Douglas' Mfg. Co., complete with augers....dis 10 @ 15 %
Common Augers....$4 25 @ 4 00
Anguar, Extra Auger.... 5 50 @ 5 00

Bolts.—Eastern Carriage Bolts....dis 60&20 %
Western " " ....dis 60&20 %
Philadelphia " " ....dis 40 %
Wrought Shutter Bolts....dis 45 %
Cast " " ....dis 35 %

Braces.—Barber's....dis 40 %
Bartholomew's....dis 10 @ 15 %
Spoffard....dis 37½ %

Butts.—Cast Fast Joint, Narrow....dis 40 %
" " Broad....dis 40 %
Cast Loose Joint....dis 50 %
" Acorn Drilled....dis 40 %
Wrought Loose Pin....dis 25 %
" Table Hinges and Back Flaps....dis 25 %
" Narrow....dis 30 %
" Loose Joint....dis 35 %
Parker's Blind Butts....dis 40 %; by the case, dis 40&10 %
Shepard's " " ....
Clark's " " ....
Palmer's " for wood....dis 45 %; by the case, dis 50 %
Garretson's " " ....
Lull & Porter's ....dis 25&10 %

Chains.—German Halter....gold list dis 20 @ 25 %
" Coil....gold list dis 20 @ 25 %
Galvanized Pump....₱ ℔ 15c
Best Proof Coil Chain—
₱ ℔..... 13¾ 10¾ 10 9½ 9¼ 9 8½c gold
3-16 ¼ 5-16 ⅜ 7-16 ½ ⅝ in.
By the cask, 360 lbs., discount ½c per lb. Common Chain, ½c per lb. less than proof.

Chisels.—Socket Framing....dis 60 @ 60&5 %
Socket Firmer....dis 60 @ 60&5 %
Tang " ....dis 40 @ 40&5 %
Beaty's Framing and Firmer....dis 10 @ 10&5 %

Casters.—Porcelain Wheel....dis 20&10 %
Iron....dis 20&10 %
Brass....dis 20&10 %

Clothes Wringers.—Universal....per doz $72 00
Novelty.... " 72 00
Reliance.... " 72 00
Providence.... " 72 00
Orders for 5 dozen, discount $3 per dozen.
King Wringers (Iron Frame)....per doz $63 00

Coffee Mills.—Common Box and Side....dis 10 @ 15 %
Patent Box and Side....dis 10 @ 15 %

Cutlery.—American Pocket (best)....dis 20 @ 25 %
Landers, Frary & Clark, J. Russell & Co. and Lamson & Goodnow Mfg. Co. Manufacturers' net prices.

Drawing Knives.—Hart Mfg. Co.'s....dis 60 @ 60&5 %
Concave Adjustable Handle....dis 10 %
Beaty....dis 10 %

Files.—Nicholson Mill Files....new list, $5 00 to £ cur
Nicholson Bastard .... " 5 00 to £ cur
" Taper .... " 5 00 to £ cur
Butcher's Mill....$5 75 to £ gold
" Bastard....5 50 to £ gold
" Taper....5 50 to £ gold
Moss & Gamble—Mill, Taper and Bastard....5 50 @ 5 25 to £ gold

Fluting Machines.
Royal, No. 1, 4½ inch Rollers....list $6 00
" No. 2, 6 " " ....list 7 00

Hammers and Hatchets.
Yerkes & Plumb's....dis 10 %
Hammond & Son's....dis 5 %

Hinges.—Strap and T....dis 30&7½ %
Bonney's No. 1 Gate....dis 25 %
" No. 2 and 3....dis 35 %

Horse Nails.

	Nos. 6	7	8	9	10
Ausable	27	25	24	23	22
Globe	29	26	25	24	23
Brundage	26	24	23	22	21
	Nos. 5	6	7	8	9	10
Putnam	32	28	26	25	24	23

On Ausable, Globe and Brundage 1000 ℔ lots....dis 5 %

Knobs.—Door (regular manufacture)....dis 40 %
Porcelain and Mineral....dis 40 %

Locks and Latches.—Rim and Mortise....dis 40 %
Till and Cupboard....dis 25 %
American Padlocks....dis 40 %
Trunk Locks....dis 5 @ 10 %
Thumb and Roggens Latches....net @ dis 10 %

Mattocks.—Long and Short Cutter....dis 15 %
Western Pattern....dis 15 %
Pennsylvania Pattern....dis 15 %

Molasses Gates.
Enterprise Mfg. Co.'s Measuring Faucets....dis 20 %
Stebbins' Gates....dis 60 @ 60&10%
Lincoln's " ....dis 40 @ 40&10 %
Landers, Frary & Clark's Petroleum....dis 10 @ 10&10 %
Taylor's Petroleum Faucets....dis 20 @ 20&10 %

Rakes.—Steel Garden....dis 30 %
Malleable Garden....dis 33⅓ %
Wood Head Iron Teeth....dis 30 @ 40 %

Rules.—Stanley Rule and Level Co....dis 60 @ 60&10 %
Steven's and Hubbard's....dis 60 @ 60&10 %

Squares.—Steel and Iron, new list....dis 50 %

Saws.—Disston's Cross Cut....dis 12½ %
Disston's Hand....dis 12½ %
W. McNeece's H'd. Cross-Cut & Circ'r, new list....dis 15 %
Boynton's Lightning, new list....dis 30 %

Shovels and Spades.
Rowland's Plain Back, list Feb. 1873....dis 20&10 %
" Back Strap " ....dis 20&10 %
Oliver Ames & Sons....net list
Brady Shovel Co....dis 7½ %

Sad Irons.—Reading (pianed face)....per lb. 5½c.
Coquanock (polished face)....
" 6c.

Stove Polish.—Gem....₱ gross, $5 00
Onyx....$5 00

Scythes.—Golden Clipper....₱ doz. $11 50
Clipper No. 10.... " 10 50
Common Scythes....₱ doz $7 00 @ 10 00

Screws.—Iron....new list, April 1st, 1873, dis 47½ %
Brass....dis 50&10 %

Spoons.—Plated Spoons, Rogers Bros.'....dis 10 @ 25 %
Britannia. Spoons....dis 35 @ 40 %
German Silver....add to list 5 %
" Light....dis 5 %

Try Squares.—Disston's....dis 12½ %
Stanley Rule and Level Co....dis 40&10 %
Willis Thrall, No. 2....dis 30&10 %
Willis Thrall, No. 1....dis 25&10 %

Tacks, &c.—Half Weight Tacks....dis 67½ %
" " by the case....dis 67½&7½ %
Clout and Finishing Nails....7½ %
" " by the case....dis 7½ %

Traps.—Genuine Oneida—Newhouse list....dis 20 %
Imitation " " " ....dis 20&10 %

Wrenches.—Coes Genuine....dis 30 @ 30&10 %
Coes Imitation Wrought Bar....dis 45 %
" " Malleable Bar....dis 50 %
" " (Kellogg) Malleable Bar....dis 55 %
Tafts Pattern....60 %
" " Kellogg's....dis 60&10 %

Wire.—No. 0 to 18....dis 30 %
No. 19 to 26....dis 40 %
No. 27 to 36....dis 33⅓ @ 35 %
Coppered 0 to 12....dis 15 @ 20 %
Tinned Broom Wire....dis 15 @ 20 %

BUFFALO.

Reported by Messrs. Sidney Shepard & Co.

Aug. 23, 1873.

Axes, Chopping—" Francis Axe Co "....$13 00 @ $14 50
Augers—C. S. Cut....dis 25&10 %
Bits, Auger—Pierce's....dis 25 %
" Jennings'....dis 10 %
Bells, Cow—Yaw's Genuine....dis 20 %
Bellows—Smiths'....dis 20 %
Bolts—Carriage and Tire, Diamond Neck....dis 65&10 %
Braces, Bit—Barber's....dis 40 %
Spofford's Patent....dis 40 %
Brads, Cut....dis 50&7½ %
Boards—Stove, Brooks' Patent, new list....dis 30 %
Butts—Brass....dis 20 %
Cast Loose Joint....dis 30 %
" " Pin....dis 40&5 %
" " " Japanned....dis 40&5 %
" " " Silver Tipped....dis 25 %
Wrought Narrow....dis 30 %
" Broad, Loose Joint....dis 35 %
" Table and Back Flaps....dis 25 %
Wrought Butts, Loose Pin....dis 25 %
Belting—Rubber....dis 30 @ 33⅓ %
Leather, new list....dis 30 @ 30&5 %
Beaters, Egg, " Peerless"....per doz $4 50
Brick—Bath (box of 2 doz) Best English....$1 50
" Rutherford "....$1 25
Bung Borers—" Enterprise"....dis 20 %
Chalk—White, Carpenter's....₱ gross, 60c
Red, Carpenter's .... " 80c
Blue, " .... " 90c
Crayon School .... " 14c
Chisels—Firmer Socket....dis 60&10 %
Framing Socket....dis 60&10 %
Corner Socket Chisels....dis 60&10 %
Slick's Carpenters'....dis 60&10 %
Castings—Malleable....₱ ℔ 10½c
Cherry Seeders....per doz $12 00
Elbows—Corrugated....5 5½ 6 7 } dis 10 %
Charcoal....$4 25 5 25 5 25 6 50 }
Russia....10 00 13 00 13 00 14 00 }
Files—Wheeler, Madden & Clemson's....dis 42½ %
Freezers, Ice Cream—" Champion"....dis 33½ %
Gates—Molasses—
Patent Self-Measuring....₱ doz., $42 00; dis 20 %
Hinges—Window Blind—
Clark's No. 20....dis 50&5 %
Shepard's Standard, and Clark s....dis 40&10 %
Garretson s ....dis 40, 10&10 %
Wrought Strap and T....dis 30&7½ %
Hods, Coal—Plain, Black and Galvanized....new list net
Funnel, Black and Galvanized....new list net
Fancy and Helmet....new list net
Hammers—Maydole's....net
Yerkes & Plumb's....dis 5 @ 10 %
Hooks and Staples—Wrought....dis 50 %
Hooks—Belt....dis 50 %
Hasps and Staples—Wrought....dis 60 %
Planes, Bench....dis 20 %
Sad Irons....₱ ℔ 5c
Kettles—Brass....₱ ℔, 50c
Enameled....new list dis 40 %
Knives, Drawing—Oval No. 1....dis 60&10 %
Razor Blade....dis 50&10 %
Lanterns " Peerless,"....No. 1 5 10
₱ doz $26 00 $11 23 $13 75 dis 10 %
"Radiant"....No. 75 100 150 175
₱ doz $13 13 $13 13 $22 50 $22 50 dis 20 %
Tubular....$13 00
" with Guards....13 50
Mica....net 50 lbs., 5 %; 100 lbs., 10 %; 200 lbs., 20 %
Machines—Apple Paring, " Reading,"....$8 50 ₱ doz
Mills, Coffee—Box and Slide, common....dis 15 %
Box Union and Eagle....dis 15 %
" Enterprise"....dis 20 %
Nails—Cut, Chesapeake....$4 50
Clout and Finishing....dis 7½ %
Shoe....dis 7½ %
Horse, Ausable....No. 5 6 7 8 9 10
30 27 25 24 23 22c
" " Finished & Pointed....and 1c ₱ ℔
" " 1000 lbs....dis 5 %
" Clinton....No. 6 7 8 9 10
22 20 19 18 17c
Packing—Rubber....dis 30 @ 33⅓ %
Pencils, Slate—Soapstone....4 5 6 in.
30 40 50c. ₱ 100
Case lots....dis 20 %
Paint—White Lead, U. S. Gov't....₱ ℔ 9½c
Rivets—Iron, Black and Tinned....dis 20 @ 25 %
Copper....dis 10 %
Rope—Manila, ¾ inch and larger....₱ ℔ 17½c
Rules—Boxwood and Ivory, Stephens....dis 50&10 %
Screws—" American Screw Co"—
Flat Head, Iron....dis 47½ %
Flat Head, Brass....dis 60 %
Staples—Blind, Boardman's Pat., ½ & ⅝....₱ ℔ 37½c
Skates—White's....
Straps, Skate—Russet and Black....net @ 20 %
Spoons, Iron Tinned....dis 10 %
" by the case....dis 20 %
Plated Rogers' A No. 1....dis 20&5 %
Britannia....dis 40 %
Squares—Steel and Iron....new list 50 %
Shoes, Horse—H. Burden & Sons....₱ keg $6 50
Shovels & Spades—Shepard, Forsyth & Dennison....15&20 %
Saws—Henry Disston & Sons....dis 10 %
Scales—Buffalo Scale Works....dis 25 %
Fairbanks....dis 15 %
Shears—Seymour's....dis 5 @ 1 %
Traps, Steel—Newhouse....dis 20 %
Tacks—Half Weight Am. Iron....dis 67½&7½ %
Vises—Parallel, Buffalo....dis 15 %
Wrenches—Coes' genuine....dis 30&10 %
Coes' Imitation....dis 50&10 %
Tafts' Pattern....dis 65&10 %
Ware—French, Tinned and Iron....dis 25 %
Stamped and Japanned....net
Cast Iron Hollow....dis 20 @ 25 %
Tin Plates.—Add for each X....2·50
10x14, IC. Charcoal...$13·50 | 14x20 C. terne....$12 37½
12x12, " ....14·00 | 20x28 C. " 26 00
12½x17, " ....15·00 | 20x28 X. " 31 00
14x20, " ....14·50
Pig Tin—Straits....39c @ 40
Banca....45c @ 46
Bar Tin....41c
Solder....No. 1, 21½c; No. 2, 19½c
Sheet Zinc—
"Lasalle"....5 7 0 | 3 0 0 | 2 0 0 | 100 ℔ casks
11·00 | $11·20 | $11·20 | $11·20 ₱ 100 ℔
Iron Wire—Bright and Annealed....dis 27½ %
Coppered....dis 22½ %
Tinned....dis 15 %
Tinned Broom, Nos. 20 21 22 ....dis 20 %
20c 21c 21c
Copper—Sheathing 14 @ 18 oz....₱ ℔ 37c
Planished....₱ ℔ 41 @ 46c
Bottoms....₱ ℔ 39c
Bolts....₱ ℔ 40c
Braziers' Sheets....₱ ℔ 40c
Sheet Iron.—
18 Common....$5 80
24 Common....6 00
24 W. D. Wood & Co., Smooth Finish....7 25
Am. Russia....A. B.
14c 12c
Gen. Russia, No. 1 stained....21c
" " clean....22c
Galvanized....dis 20 %

PITTSBURGH.

Card Rates, 60 days.

Flat Bar.—
1½ to 4 x ⅝ to 1 inch..3·8c
4¼ to 6 x ⅜ to 1 inch..4·0c
1¾ to 6 x 1⅛ to 1½ in..4·2c
Horse Shoes.—
All sizes....5·3c
Heavy Bands.—
3½ to 6 x ¼ & 5-16 in..4·4c
1½ to 3½ x ¼ & 5-16 in..4·5c
Light Bands.—
3 to 6 x 3-16 to No. 12..4·8c
1¼ to 2¾ x 3-16 to No. 12....5·0c
Hoops.—2¾ to 3 in....5·1c
3¼ to 4¾ in....5·3c
1¾ to 2 in....5·3c
1⅝ to 1 11-16 in....5·6c
1⅜ & 1¼ in....5·9c
Round and Square.—
1 to 1¼ in....3·8c
2 to 2¾ in....4·1c
3 to 3¾ in....4·3c
3¾ to 4 in....4·8c
⅝ to 9-16 in....4·2c
Oval Iron.—
¼ to 1¼ in....4·4c
⅜ to ¾ in....4·6c
Half Oval and Half Round.—
¼ to 1¼ in....4.7c
⅜ to ¾ in....5·2c

Sheet Iron, 10 to 14....5·4 6·9 8·4
" 15 to 20....5·6 7·1 8·6
" 21 to 24....5·8 7·3 8·8
" 25 to 26....6·0 7·5 9·0
" 27....6·2 7·7 9·2
All sheets over 28 in. wide, ¼c. ₱ ℔ extra.

Tank Iron —
3-16, ¼ & ⅜ in. thick..5·6c
Boiler Plate Iron....7·5c
Heads not flanging....6·7c
Railroad Iron—Countersunk and Punched.—
1¼ x ⅜, 7-16 & ½ in....5·2c
1¼ x ¼ & 5-16 in....5·7c
Extras for Cutting to Length.—
Flat bars and rounds and squares....1c
Flat bars for tire....1c
Heavy bands....5c
Light bands and wagon box iron....4c
Hoops....5c
Nails—Standard list....$4 75

The following are the Card rates of Lewis, Oliver & Phillips:

Iron, standard list, assorted sizes, for large orders, 3·8c, card rate, 2 % off net.
Iron Wedges....5¼c ₱ ℔ net
Norway Nail Rods....9½c ₱ ℔ net
Fence Pickets—
⅝ round, bent to shape..30c ₱ ft. of fence, less 5 % off net
Discount off Standard List.
Carriage and Tire Bolts (new list)....60&15 % off net
Plow Bolts....25 % off net
Stove Bolts....at the list price
Machine and Square Head Bolts....25 % off net
Coach and Lag Screws....25 % off net
Bolt Ends....20 % off net
Pat. Hot Pressed Square and Hexagon Nuts, small sizes, from 3-16 to ⅜ in....6 c ₱ ℔ off net
Pat. Hot Pressed Square and Hexagon Nuts, large sizes, from 7-16 to 2 in....4½c ₱ ℔ off net
Washers, all made from new band iron, small sizes, from 3-16 to ⅜ in....7 c ₱ ℔ off net
Washers, all made from new band iron, large sizes, from 7-16 to 1⅜ in....5 c ₱ ℔ off net
Nuts and Washers in 25 lb. boxes, 1c ₱ ℔ ex. Nuts and Washers in lots less than one keg each size, 1c ₱ ℔ ex.
Harrow Teeth, in lots of 1 ton or more, packed in casks, 1 in. diam. 5c ₱ ℔ net; ⅞, ¾ in. diam. 5c ₱ ℔ net; ⅝ in. diam. 5¼c ₱ ℔ net.
Patent Headed Harrow Teeth, packed in casks, ¼c ₱ ℔ ex
Skein Bolts, in bulk, in lots of 5 kegs or more, ⅝ in. diam. 8c ₱ ℔ net; 9-16 in. diam. 9c ₱ ℔; ½ in. diam. 10c ₱ ℔. 1c ₱ ℔ extra when less than 1 keg of each size is ordered.
Screw Hook-and-Eye Hinges, ¾ to 1 in. diam. 9¾c ₱ ℔ net; ⅝ in. diam. 10¾c ₱ ℔ net; ½ in. diam. 12¾c ₱ ℔ net.
Screw and Strap Hinges, in lots of 100 pairs or more, 14 to 16 in. long, 7c ₱ ℔ net; 8, 10 & 12 in. long, 8½c ₱ ℔ net.
Strap and T Hinges....20 % off net, delivered
Screw Hitching Rings....$6 50 ₱ 100 net
Duck Nest Tuyere Irons....$16 00 ₱ doz net
Cast Iron Washers....₱ ℔ 4½c net
Bridge and Roof Bolts—
1 to 2 in. diam. over 8 ft. long....₱ ℔ 5½c net
1 to 2 in. diam. from 4 to 8 ft. long.... " 5½c net
1 to 2 in. diam. from 1½ to 4 ft. long.... " 6 c net
⅝, ¾ and ⅞ in. diam. over 4 ft. long.... " 6½c net
⅝, ¾ and ⅞ in. diam. from 1½ to 4 ft. long " 6½c net

WAGON HARDWARE.

Wagon Box Strap Bolts—
10 in. long by 7-16 at Screw End, ₱ set of 8 bolts.. 55c
12 " ½ " " 8 " .. 70c
10 " 9-16 " " 8 " .. } 90c
12 " 9-16 " " 8 " .. }
14 " 9-16 " " 8 " .. $1 00
10 in. long by ⅝ at Screw End, ₱ set of 8 bolts.. } 1 00
12 " ⅝ " " 8 " .. }
14 " ⅝ " " 8 " .. 1 10
16 " ⅝ " " 8 " .. 1 20
5c ₱ set for each additional inch over 14 in. All lengths made.
Wagon Box Rods, narrow track, each....18c
" " wide track, each....20c
Single Tree Irons, ₱ set of four pieces....38c
Wrought Iron Bolster Plates, 2¾ in. wide, ₱ set.... 60c
" " 3 " " 65c
" " 3¼ " " 70c
" " 3½ " " 75c
Wagon Brake Ratchets, each....16½c
" " " finished with guard, each..45 c
Wrought Hammer Straps, heavy pattern, each....16 c
" " " light " each....13½c
" Rub Irons, each....11 c
Stay Chain Hooks, each....8 c
Double and Single Tree Clips, figure 1, each....9 c
" " " " 2, each....10 c
" " " " 3, each....12 c
Strap Bolts, Rods, Single Tree Irons, Bolster Plates, Brake Ratchets, Hammer Straps, Rub Irons, Stay Chain Hooks and Clips, in lots of 100 sets....dis 25 %
Wagon Box Staples, 1¾ to 2½ in. to clinch, ₱ 100 $13 50 net
" " Box Iron, to rivet on, ₱ 1000 9 50 net
Neck Yoke Eyes, each....5½c net
" " with ⅜ rings, each....8½c net
King Bolts, ¾, 1, 1¼, and 1¼ in. diam....₱ ℔ 5½c net
Wagon Rivets, ex. large, oval and steeple head, ¼ in. diam. all lengths....10 c net
" " " & Nails, in 5 ℔ paper boxes....₱ ℔ 1c extra
" " " in 25 ℔ wood " ....½c extra
Wagon and Hinge Nails, ¼ in....₱ ℔ 17 c net
" " " 3-16 in.... " 19 c net
Double Tree Plates....
Coupling " .... } " 9 c net
Tongue " .... }
Neck Yoke Plates.... " 12 c net
Tongue Cap Iron, 1¾, 2 & 2¼ in. wide, same price ₱ ℔ as Band Iron.
Wagon Chains, Stay Lock and Tongue, 5-16 in, ₱ ℔ 11½c net; ¼ in., 12½c. net.

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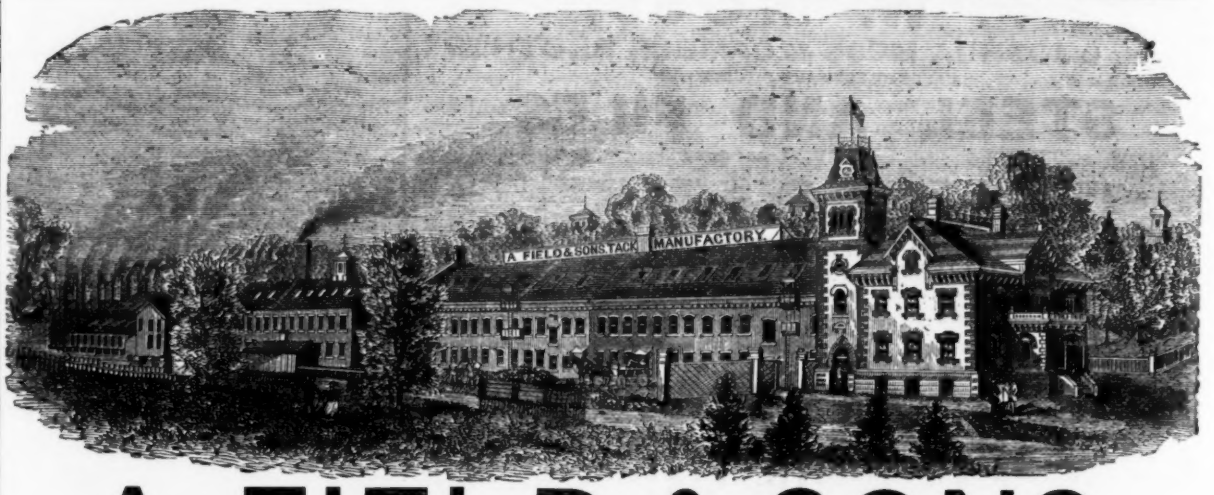

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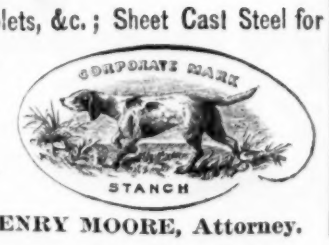

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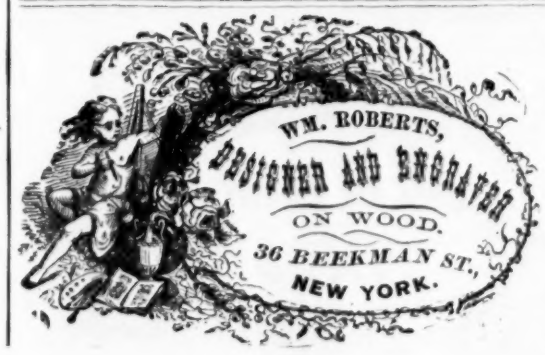

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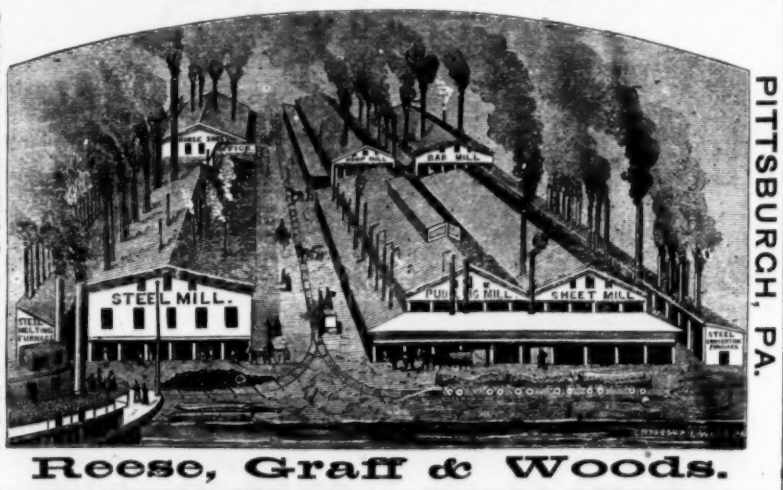

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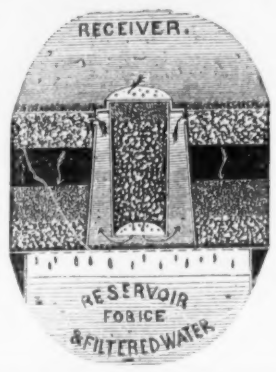

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"Mr. Whitney is qualified by experience and practical knowledge. His life and experience have been such as to develop the fullest sympathy with men engaged in industrial pursuits, especially inventors. *Moore's Rural New Yorker*, June 8.

Address, for full information, free of charge,
128 Broadway, Room 11, New York City.

BOSTON.

(Reported by Macomber, Bigelow & Dowse, 42 to 48 Battermarch St.)

Axes.—Forester's Favorite, Bronzed	$13 00
Blue Jackets, Blue	12 50
Excelsior, Red	12 00
Chopper's Pride, Bronzed	11 00
Red Cross, Red	10 50
Red Cross, Handled	13 50
Boy's Handled Blue Jackets	12 00
Bells.—Hand	dis 60&10 %
Bolts.—Carriage, Common, new list	dis 65&10 %
Braces.—Barber's	dis 40 %
Backus's	dis 40&5 %
Spofford's	dis 40 %
Butts.—Union Drilled Loose Joint	dis 45 %
" " Wire Fast Joint	dis 35 %
" " Acron Loose Joint	dis 35 %
Alden's Drilled Plain, Reversible	dis 35 %
" " Acorn, "	dis 25&10 %
Wrought Table Butts and Back Flaps	dis 25 %
Wrought Narrow Butts	dis 30 %
Castors.—Revised List	dis 30&10 %
Cordage.—Manila, no discount	℔ 17c
American Tarred Hemp Lath Yarn	℔ 10c
Corn Hooks.—Extra Quality, Strapped	℔ doz, $2 75
Crow Bars.—Iron, Steel Points	℔ 6½c
Enam. Ware.—Kettles	dis 25 %
Files.—Earl Smith & Co.'s English	$5 to £ gold
American	$5 to £ currency, less 10 %
Nicholson	$5 to £ currency, less 7½ %
Hammers.—Maydole	dis 5 %
Hangers & Rollers.—Novelty	dis 30 %
Hatchets.—Underhill Edge Tool Co	dis 10 %
Hinges.—Strap and T	dis 30&7½ %
Plate, Loose, and Fast Joint	℔ 8c
Locks.—P. & F. Corbin	dis 40 %
No. 408, Iron Face and Bolts, Mortise..per doz net	$1 88
Nails.—10d and larger	$4 75
Paper.—Finest Quality Manila	℔ 11c
Parers.—Reading, New Pattern	per doz $8 00
Picks.—K. P. & Co., Polished Points—	
5 to 6	per doz $10 00; 6 to 7, $10 50
Pulleys.—Clark & Co.'s Axle, 1¾ in.—	
	per doz 37c.; 3 in., 42c
No. 115, Axle 1¾ in	per doz 37c
Plated Ware.—Rogers Bros., Advanced:—	
Under $300	dis 20 %
Over $300	dis 20&5 %
Pocket Knives.—Connecticut Cutlery Co	dis 33⅓ %
Rules.—Stephens & Co	dis 60 %
Saws.—Disston's	dis 12½ %
Screws.—American Screw Co	dis 47½ %
Shovels.—O. Ames	dis 2½ %
M. B. & D	dis 5 %
Traps.—Oneida	dis 20 %
Blake's	dis 20&5 %
Vises.—K. P. & Co.'s Solid Box, Blacksmith	℔ 15½c
Parker's Parallel	dis 5 %
Backus	dis 25 %
Weights.—Window Weights	℔ 2½c
Wrenches.—Coe's Genuine Wrenches	dis 40 %
Wringers.—	
Novelty Tub, No. 2, less than 5 doz	per doz $ 72 00
Universal, No. 2, less than 5 doz	per doz 69 00
" 5 doz. "	per doz 67 00
Novelty Bench, No. 4, less than 5 doz	per doz 108 00
" " " 5 doz	per doz 104 00
" " " 10 doz	per doz 101 00

Boston Metal Market.

(Corrected by Fuller, Dana & Fitz.)

Tin Plates.—	℔ box	I. C. Coke	@ $12 00
I. C. Charcoal	@ $13 50	Terne	11 50 @ 13 00
Pig Tin.—	℔ ℔	Straits, gold	32c
Banca, gold	37c	English "	32c
Copper.—	℔ ℔	Braziers	40c
Sheathing	40c	Ingot	28c
" Yellow	c	Old	26c
Bolt	40c		
Lead.—	℔ ℔	Sheet and Pipe	9 45c
Spanish Pig, gold	6¾c	Old	6¾c
Spelter.	℔ ℔	American, gold	c
Silesian, gold	8c		
Zinc.—Sheet			℔ ℔ 10½c
Iron.—Sheet Iron, Russia, gold			℔ ℔ 18c
Sheet Iron, English			" 7c
" " American			" 7½c
" " Galvanized			" 11c @ 18c
Swedes Bar Iron, Flat, gold			℔ ton, $145 00 @ $155 00
" Shoe Shapes, gold			155 00 @
Norway Bar Iron, Flats, gold			145 00 @ 152 00
" Shapes, gold			155 00 @
" Round, 2 in. to ⅝ in., gold			147 50 @ 152 50
" " 11-16 to ⅝ in.		"	162 50 @
" " 5-16 to ¾ in.		"	165 00 @
" Nail Rods, Rolled		"	177 50 @
" " U. B.		"	172 50 @
" " Benzon		"	167 50 @
" " Vasa		"	160 00 @
" " N I W		"	160 00 @
English Refined Bar Iron			37 50 @
Scotch Pig Iron			40 00 @ 45 00
American "			40 00 @ 49 00
Wrought Scrap Iron			45 00 @
Steel.—	℔ ℔	German	11c
Eng. Tool, gold	16c	Spring	9c
" Mach. "	10c	Tire	8c
American Tool	16c	Sleigh Shoe	6¾c
" Mach	11c	Toe Calk	8¾c
Bessemer	8½c @ 9½c		

ST. LOUIS.

Corrected weekly by Semple, Birge & Co.

Anvils.—Armitage	℔ ℔, gold, 16c
Peter Wright's	" " 14½c
Wilkinson's	" " 12½c
Apple Parers.—Conqueror	℔ doz, $9 00
Lightning	" 9 00
Turn Table	" 9 00
Augers and Bits.—Cook's	dis 25 %
Ives'	dis 20 %
Jennings'	dis 5 %
Snell's	dis 12½ %
Axes.—Hunt's	℔ doz $14 50 @ 15 50
Lippincott's	" 14 00 @ 15 00
Lippincott's Pioneer	" 14 50 @ 15 50
Simmons'	" 13 50 @ 14 50
Axles.—Kritch & Crane Mfg. Co.'s—	
Patent Taper Axles	dis 10 %
Swelled Taper Axles	dis 10 %
Concord Axles	dis 10 %
Red Jacket Axles	dis 10 %
Common Axles, 1⅝ inch and upward	℔ ℔, 8½c
" " less than 1⅝ inch	" 9½c
Bells.—Troy, Church	℔ ℔, 50c
Light Brass, Hand	dis 50 %
Moore's, Cow	dis 10 %
Bolts.—Arms, Bell & Co.'s Machine	dis 10 %
Arms, Bell & Co.'s Carriage and Tire	dis 60& 20%
Norway Iron Carriage and Tire	dis 40 %
Cast Iron Barrel, Shutter, &c	dis 25 %
Cast Butt Hinges.—Narrow Fast Joint	dis 25 %
Broad Fast Joint	dis 40 %
" Loose "	dis 50 %
Reversible	dis 45 %
" Japanned and Silver Tipped	dis 40 %
Loose Joint "Acorn" " "	dis 40 %
Excelsior Reversible Blind	dis 30& 10 %
Lull & Porter's Blind	dis 35 %
Wrought Butts.—Narrow	dis 15 %
Reversible	dis 20 %
Broad	dis 20 %
Table Hinges	net list
Back Flaps	net list
Inside Blind Hinges	net list
Casters.—Porcel'n Wheel Bed or Plate..rev. list	dis 15 %
Iron or Brass Wheel Bed or Plate	
Chain.—Eng. Coil..3-16 ¼ 5-16 ⅜ 7-16 ½ in.	
14 11¼ 10¾ 10 9½ 9c	gold
Trace 6½-10-2	75c "
7-10-2	80c "
German Coil and Halter..new list add	25 % "
American Coil—Short Link.	
Size, inches ⅜ 7-16 ½ 9-16 ⅝	
Price cents ℔ 12¾ 12½ 10¾ 10 9½	net
Size, inches 11-16 ⅝ 13-16 ¾ 15-16	
Price, cents ℔ 9¾ 8¾ 8¾ 8½ 8¾	net
Size, inches 1 1 1-16 1⅛ 1 3-16 1¼	
Price, cents, ℔ 8¼ 8¾ 8 7¾ 7¾	net
All larger sizes same price as 1¼ in. Stud chain 1c less than same size close link.	
Chisels.—Socket, Firmer or Framing	dis 55 %
Clothes Wringers.—Colby's	℔ doz $66 00
Novelty	" 72 00
Universal	" 72 00
Monitor	" 72 00
Coffee Mills.—Parker's	net list
P. S. W. & Co.'s	net
Corn Knives.—Dunn E'ge T'ol Co.'s Clip	℔ doz $5 75
Disston's	" 6 00
Crow Bars.—Steel Pointed	℔ ℔ 8 @ 10c
Solid Cast Steel	" 20c
Cutlery.—J. Russell & Co.'s	new list, dis 15 %
Lamson, Goodnow & Co.'s	
Landers, Frary & Clark's	
Files and Rasps.—	
Nicholson's Mill Files	$5 50 to the £, currency
Nicholson's Other Files	5 00 to the £, currency
Butcher's Files	7 00 to the £, currency
Heller's & Bros. Horse Rasps	5 25 to the £, currency
Forks and Hoes.—	
Auburn Mfg. Co.'s Hay and Manure Forks	dis 25 %
" " Handled Hoes	dis 20 %
" " Planter Eye Hoes	add 20 %
Winsted's Planter Eye Hoes	add 20 %
Hammers.—Yerkes & Plumb	new list net
Masons' Hammers	℔ ℔ 20c
Smith Hand Hammers	" 22c
Handles.—Axe	Extra. No. 1. No. 2. No. 3,
	$2 75 $2 25 $1 75 $1 00
Pick	Extra. No. 1. No. 1½. No. 2.
	$2 50 $2 00 $1 75 $1 25
Smith & Montross Fork, Hoe and Rake	dis 10 %
" " Broom and Mop	$12 @ $18 ℔ M.
Harrow Teeth.—1 inch iron	℔ ℔ 5½c
⅞ and ¾ inch iron	" 5½c
⅝ inch iron	" 5½c
Barbed or Headed	½c extra
Hatchets.—Hunt's	net list
Simmons'	dis 5 %
Hay Knives.—Lightning	℔ doz $22 00
Dunn Edge Tool Co.'s	℔ doz $14 50—dis 15 %
Fisher's	" 16 50—dis 10 %
Hinges.—Strap and T—St. Louis make	dis 20 %
Horse Nails.—Eureka	23c rates
Ausable	22c "
Northwestern	22c "
Eagle	19c "
National Patent Pointed	21c "
" " Extra Finished	22c "
Horse Shoes.—R. I. (Perkin's pat.)	℔ keg $7 00
Burden's	" 7 00
Mule Shoes	$1 00 extra
Rhode Island Trotting Shoes	2 50 "
Locks and Latches.—	
Jones & Nimick's	revised list dis 40 %
Moorhead, Adams & Co	dis 35 %
Norwalk Lock Co.'s revised list	dis 33⅓ %
Mattocks and Grub Hoes.—	
Klein, Logan & Co.'s Mattocks	℔ doz. $15 00 @ 16 00
" Grub Hoes, Oval Eye	℔ doz. 12 00 @ 13 00
Nails.—Wheeling	$4 75 rates.
Orders for 100 kegs 10c ℔ keg less.	
Picks.—Klein, Logan & Co.'s R. R. and Clay	℔ doz. $12 00
Klein, Logan & Co.'s Coal	" 9 75
" " Poll	" 12 00
" " Stone	" 16 50
" " Tamping	" 19 00
Planes.—Ohio Tool Co.'s	dis 10 %
Eastern	dis 20 %
Post Hole Augers.—Clark's Patent—	
No. 1, ℔ doz. $27; No. 2, $30; No. 3, $32	dis 30 %
Barton's Patent	℔ doz $25—dis 20 %
Vaughn's "	" 25—dis 10 %
Sad Irons.—Monitor Brand, Silver Polished	℔ ℔ 6c
Sash Weights.—Standard Solid Eyes	℔ ℔ 3½c
Saws.—Disston's	dis 10 %
Spear & Jackson's	$5 00 to £ gold
Hubbard, Lippincott, B. & Co.'s	dis 10 %
Branch, Crooks & Co.'s	dis 10 %
Livingston's Patent Buck	net list
Screws.—American Screw Co.'s revised list	dis 45 %
$2000 worth in 6 months	2½ % extra
Scythes.—Blood's C. S. & G. S.	net list
Dunn Edge Tool Co.'s, Factory List	dis 15 %
Paris Furnace Co.'s	dis 25 %
Waldron's English	$10 00 to £
Scythe Stones.—No. 1 ind'n Pond	℔ gr's, $7 00
Extra Indian Pond	" 7 50 dis 25 %
Premium	" 9 50
Diamond Grit	" 13 50
Shovels, Spades and Scoops.—Ames'	new list $1 to list
Lippincott's	new list net
Rowland's, Maxwell	revised list net
Sledges.—Smith's Stone or Coal Sledges—	
Steel Face Polished	℔ ℔, 17c
Solid Cast Steel	" 35c
Striking Sledges	℔ ℔ extra, 1c
Snaths and Cradles	dis 20 %
Springs.—Cleveland Spring Co.'s—	
Carriage and Express	dis 5 %
Blue Seat Springs	new list dis 10 %
Tacks.—Norway Tack Co.'s ½ weight	dis 67½ %
Brads	dis 50 %
Traps.—Newhouse Patent	dis 15 %
Reichard's Animal, Wood Bottom	℔ doz $10 00
" Metal Bottom	" 12 00
Vises.—Solid Box	℔ ℔ 18c
Wilson Mfg. Co.'s	dis 15 %
Wrenches.—Coes' Genuine	dis 30 %
Coes' Pattern	dis 40 %
Taft's	dis 50 %

St. Louis Metal Market.

(Corrected Weekly by Messrs. R. Sellew & Co.)

Tin Plate.			
IC, 10x14, Charcoal	$14 00	IX, 20x28, Terne	$52 00
IX, 10x14, "	17 00	IC, continuous,	
IC, 12x12, "	14 50	20 in. x 200 ft	26 00
IX, 12x12, "	17 50	IX, continuous,	
IC, 14x20, "	15 00	20 in. x 200 ft	34 00
IX, 14x20, "	18 00	IC, 10x14, best Coke	13 50
IC, 14x20, Terne	13 50	IC, 10x14, good "	14 00
IX, 14x20, "	15 50	IC, 10x20	20 00
IC, 20x28, "	27 00	IC, 14x20	13 50
Block Tin.			
Large Pigs	42c	Bars	44c
Small "	43c		
Sheet Zinc.			
Casks	℔ ℔ 11c	Sheet	℔ ℔ 11¼c
Solder.			
No. 1, Refined, in bars or plate			28c
No. 2, " " "			21c
Pig Lead			8c
Sheet Copper.—18 to 100 lbs. Sheets 30x60			40c
14 to 16 lbs., Sheets 30x60			42c
10 to 12 lbs., " and 20x72			45c
6 to 9 lbs., " "			48c
Tinned, 14 and 16 oz. 14x48			38c
Planished, 14 and 16 oz. 14x48			46c
" No. 7, 8 and 9			48c
Copper Bottoms			40c

Sheet Iron.—	Com'n.	Sm'th.	Char'l.	Jun.
No. 16 to 20	6¼c	7¼c	8¾c	
No. 22 to 24	6¼c	7¼c	8¾c	
No. 26	6¼c	7¼c	9c	11¼c
No. 27	6¾c	7¾c	9¾c	11¾c

Galvanized Iron	dis 35 %
Iron Rivets	dis 15 @ 30 %
Iron Wire	dis 25 %
Coppered Pail Bail Wire	dis 10 %
Copper Rivets and Burs	dis 10 %
Russia Iron.—Nos. 9, 10, 11 and 12,	℔ ℔ 23c
No. 1, stained,	℔ ℔ 22c
Imitation Russia,	℔ ℔ 15c

CHICAGO.

(Reported by Cragin Bros. & Co., 141, 143, and 145 Lake St.)

Tin Plate.—		IXX, 14x20, Charcoal	21 00
IC, 20x14, Coke	$13 00	IXXX, 14x20, "	24 00
IC, 10x14, Charcoal	14 00	IXXXX, 14x20, "	27 00
IX, 10x14, "	17 00	IX, 14x14, "	28 50
IC, 12x12, "	14 50	DC, 100 Plate, "	14 00
IX, 12x12, "	17 50	DX "	17 00
IC, 14x20, "	15 00	DXX "	20 00
IX, 14x20, "	18 00	DXXX, "	23 00
IC, 14x20 Coke Roofing			19 50
IC, 10x20 Coke, for Gutters			21 00
IC, 14x20, Charcoal Roofing			13 50
IX, 14x20, "			15 50
IC, 20x28, "			27 50
IX, 20x28, "			32 50

Pig Tin.—	
Large, 60 ℔	42c
Small, 80 ℔	43c
Bar Tin	44c
Zinc.—	
In casks 1000 ℔s	11 c
" 500 "	11¼c
In sheets	11½c
Slab	9c
Copper.—Copper Bottoms	40c
Sheathing Copper	38 c
Planished Copper, 14x48	46 c
Size, 14x52, 14x56, 14x60	
Nos. 7 8 9	Planished Copper 43 c
Brazlers' Sheets, 30x60.—6 to 8 lbs	46 c
10 and 12 lbs	43c
15 to 100 lbs	40c
Ingot Copper	
Bolt "	45c
Solder.—Extra Fine, C. B. & Co.'s Brand	25c
Fine, No. 1	23c
Ordinary, No. 2	21c
Plumbers' Solder	23c
Braz'rs' or Spelt'r Solder	35c
Antimony	20c
Babbit Metal	15c. @ 25c.
Galvanized Iron Conductor Pipe	℔ ℔ 10c

Sheet Iron.—

	Common.	Smooth.	Charcoal.
No. 14 to 24	6¼c	7¼c	8¾c
25 & 26	6¼c	7¼c	9 c
27	6¾c	7¾c	9½ c

Add ¼c ℔ in for 30 in. wide.

Galvanized Iron	dis 25 %
No. 16 to 20	15c
21 to 24	16c
25 & 26	17c
No. 27	18c
28	20c
Russia Iron.—	
Perfect, 8, 9 and 10	23c
" 11 and 12	22c
No. 13	c
In Sheets, 1c. higher.	
American Russia.—	
A	15c
B	13c
In sheets, 1c higher.	
Lead.—	
Pig	8¼c
Bar	10c
Lead Pipe, in full coils	10½c
Lead Pipe, when cut	11c
Sheet Lead	10½c

DETROIT.

(Reported by Messrs. Jewett & Root.)

Tin Plate.—Best Charcoal	
IC, 10x14	$13 50
IX, 10x14	16 25
XX, 10x14	19 00
IC, 12x12	14 00
IX, 12x12	16 75
IC, 14x20	14 50
IX, 14x20	17 25
XX, 14x20	20 00
XXX, 14x20	22 75
XXXX, 14x20	25 50
DC, 100 Plate	13 00
DX "	15 75
DXX "	18 50
DXXX "	21 25
DXXXX 100 Plate	24 00
IX, 14x14	25 00
IC, 10x14 W	13 00
IX, 10x14 W	15 75
Roofing Tin.—Best Char.	
IC, Terne, 14x20	$12 40
IX, " 14x20	15 15
IC, Terne, 20x28	26 00
IX, " 20x28	31 00
Coke Tin.—	
IC, 10x14 Coke	$12 50
IX, 10x14, Coke	15 25
IC, 14x20, "	13 50
Copper.—	
Sheathing	37½c
Copper Bottoms	39½c
Planished Copper.—	
Sheathing, 14x48	46c
Boiler Size, No. 7	48c
" " No. 8	48c
" " No. 9	48c
Pig Tin.—	
Large Pigs	29c
Small Pigs	30c
Bars	31c
Solder.—No. 1	21½c
No. 2	19½c
Bright Wire	dis 20½ %
Sheet Iron.—	
No. 18 Am. Com	6 c
No. 24 Am. Com	6 c
Pat. Am. Russia "A."	
Nos. 24, 25 & 26	14c
Russia No. 9, 10, 11 & 12	21½c
W. D. WOOD'S & CO.'S SHEET IRON.—	
Nos. 15 to 20 Smooth	$7 15
" 21 to 24	7 25
" 25 & 26	7 55
" 21 to 24 Char'l	8 85
" 25 & 26 "	9 05
Sheet Zinc.—Any width	10¾c

CINCINNATI.

Reported by Sellew & Co., Importers and Jobbers Metals, No. 214, 216 and 218 Main street.

Tin Plate.—I. C. 10x14 Charcoal	$14 00 @ $15 00
I. C. 10x14 best Coke	13 00 @ 14 00
I. C. Terne, 14-20	12 50 @ 13 50
I. C. " 20-28	26 00 @ 28 00
I. C. Continuous	28 00
Pig Tin.—	
Banca	℔ ℔ 47c
Straits	℔ ℔ 42c
English	42c @ 43c
Solder.—	
S. & Co	℔ ℔ 28c
A I	℔ ℔ 26c
Roofing	" 24c
Lead.—Pig	℔ ℔ 7½c @ 8c.
Bar	℔ ℔ 8c @ 9c
Copper.—	
Ingot	℔ ℔ 31c @ 33c
Planished	" 51c @ 53c
Sheathing	" 44c @ 46c
Bolt	" 40c
Brazier, 6 to 9 lb	℔ ℔ 46c
" 10 to 14 lb	" 43c
" 14 to 100 lb	" 40c
Copper Bottoms	" 45c
Zinc.—Cask, 500 to 1000 lbs	℔ ℔ 11½c
Case, 100 lbs	" 11¾c
Slab	" 8¼c @ 9c
Brass.—	
Roll, No. 6 to 30	℔ ℔ 45c
" 30 to 38	" 65c
Roll, No. 38 to 40	℔ ℔ 50c
Wire, No. 0 to 20	℔ ℔ 50c
" 20 to 25	" 60c
Babbit Metal.—	
Sellew & Co	℔ ℔ 35c
Black Lead	℔ ℔ 25c
Market	" 15c
Antimony	℔ ℔ 22c
Bismuth	℔ ℔ $6 00
Nickel	℔ ℔ $5 00

Sheet Iron.—

	Com. B.	Fin. S.	I. U.	D. Re'fd.
15 to 20	6½c	7¼c		9½c
22 to 24	6¾c	7¾c		9¾c
26	6¾c	8½c		9¾c
27	6¾c	8¾c		9¾c

Galvanized Iron.—Full bundles	dis 20 %
Nos. 18 to 20	15c
22 to 24	16c
25 to 26	17c
No. 27	18c
28	20c
Bar Steel.—Silver,	℔ ℔ 21c; Crescent, 17¼c.
Iron Wire	dis 15 %
Enameled Ware	dis 33⅓ %

One Piece Corrugated Elbows.—

Charcoal Iron.		Russia Iron.	
4½ Inch	℔ doz $8 75	4½ inch	℔ doz $8 00
5 "	" 4 25	5 "	" 10 00
5½ "	" 5 25	5½ "	" 13 00
6 "	" 5 25	6 "	" 13 00
6 "	" 6 50	7 "	" 14 00

Leader Elbows—Flat Crimp Retinued.—

	℔ doz.
2-inch	$2 00
3-inch	2 50
4-inch	3 50
2½-inch	$2 25
3½-inch	3 00
4½-inch	4 00
Sheet Iron Bread Pans	℔ ℔ 13c
American Broilers	℔ doz, $13 50
Tinmen's Machines	net list
Sad Irons	℔ ℔, 5½c
Brass Kettles.—Ansonia	48c

London Metal Market.

(From The Mining Journal.)

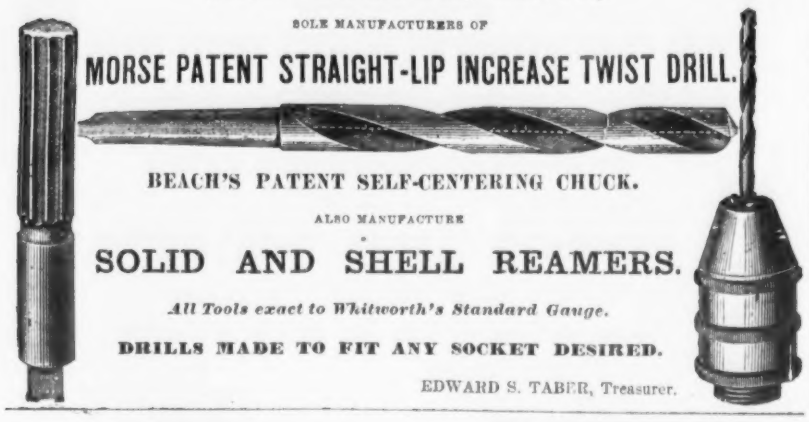
	£.	s.	d.	£.	s.	d.
Copper—℔ ton.						
Best Selected	92	0	0	95	0	0
Tough Cake & Tile	90	0	0	93	0	0
Sheathing and Sheets	95	0	0	100	0	0
Bolts	98	0	0	100	0	0
Bottoms	98	0	0	100	0	0
Old (Exchange)	80	0	0			
Burra Burra	90	0	0	91	0	0
Wire	℔ ℔.	0	1	1¼		
Tubes	"	0	1	0½	0	1
Brass—℔ ℔.						
Sheets		0	0	10	0	0
Wire		0	0	10¾		
Tubes		0	0	11¼	0	0
Yellow Metal Sheathing		0	0	8¾	0	0
Sheets		0	0	8¾	0	0
Tin—℔ ton.						
English Blocks	129	0	0	131	0	0
Ditto Bars	130	0	0	132	0	0
Ditto Refined	132	0	0	133	0	0
Banca	130	0	0	132	0	0
Straits	130	0	0	131	0	0
Tin Plates—† ℔ box.						
IC Charcoal	1 qual.	2	2	0	2	8
IX "	1 qual.	2	8	0	2	9
IC "	2 qual.	1	18	6	2	0
IX "	2 qual.	2	8	6	2	6
IC Coke	1	13	0	1	16	0
IX "	1	19	0	2	2	0
Canada Plates	℔ ton.	23	0	0	28	10
" at works		22	0	0	22	10
Spelter—℔ ton.						
Foreign		25	10	0	26	
To arrive						
Zinc—℔ ton.						
In Sheets		32	0	0	33	0
Iron—℔ ton.						
Bars Welsh, in London		12	2	0		
" to arrive		12	0	0	2	5
Nail Rods		12	10	0	2	15
Nail Rods, staff'd in L'ndon		13	0	0		
Bars		13	0	0	14	0
Hoops		14	0	0	16	0
Bars at Works		13	0	0	15	0
Hoops ditto		13		0	16	0
Sheets, single		15	15	0	17	0
Pig, No. 1, in Wales		5	0	0	6	10
Refined metal ditto		7	0	0	8	0
Bars, common, ditto		11	10			0
Do, merchant, Tyne or Tees		11	15	0	2	5
Ditto, Railway, in Wales		10	15	0	11	10
Ditto, Swedish, in London		14	15	0		
To arrive		20	0	0	21	0
Pig, No. 1, in Clyde		5	12	6	6	5

Machinery, &c.

Morse Twist Drill and Machine Company,

New Bedford, Mass.,

SOLE MANUFACTURERS OF



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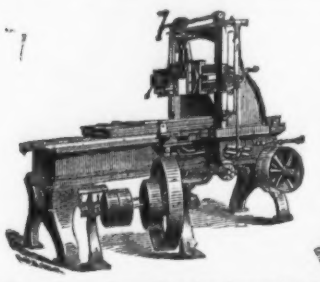

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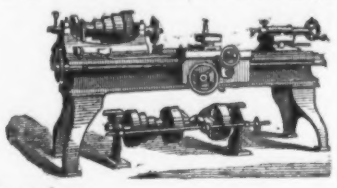

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RAILWAY SHOP EQUIPMENTS.

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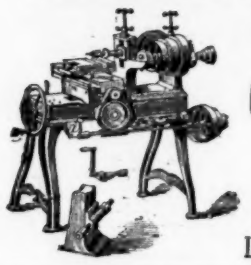

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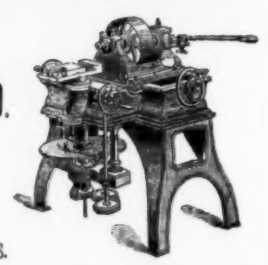

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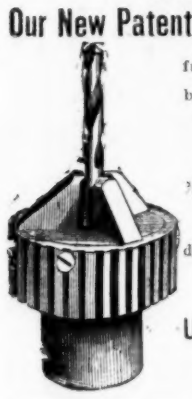
Our New Patent Improved Self-Tightening Drill Chuck, Victor No. 3.



The cut at the right shows the extra set of jaws which we furnish when ordered, at $2·00.
They can be used for chucking small articles for turning, boring, &c., from 0 to 1⅝.
The jaws can be changed in three minutes.

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☞ All its parts are of Cast Steel. Warranted to hold ⅛ to 0 drills with the clasp of the hand.

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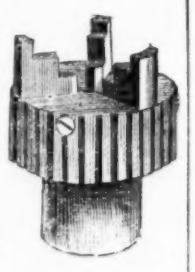

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Without BELTS or BELLOWS.

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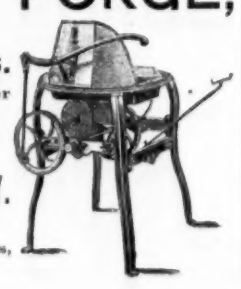

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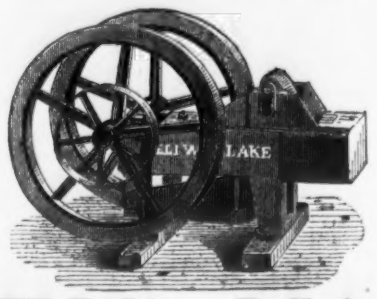

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for reducing to fragments (of any required size) all kinds of

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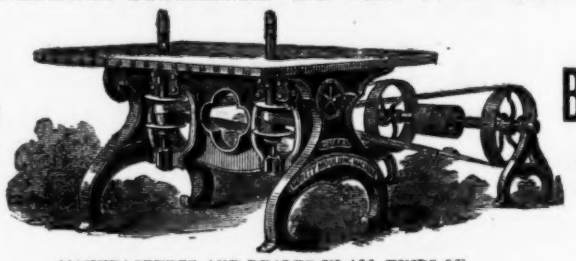

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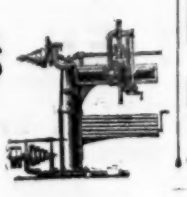

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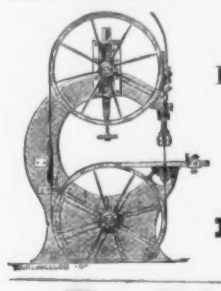

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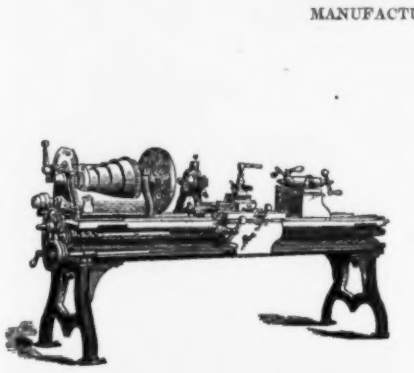

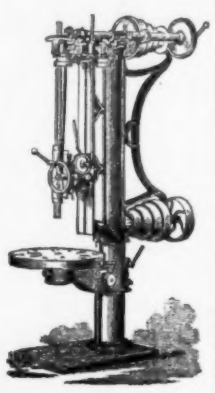

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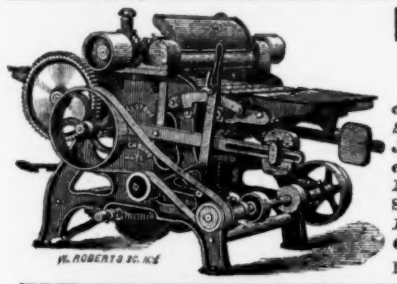

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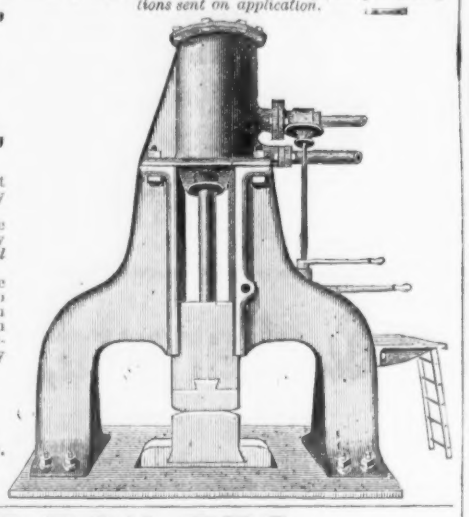

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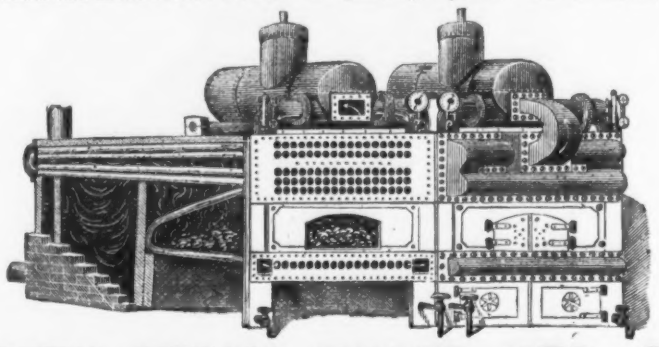

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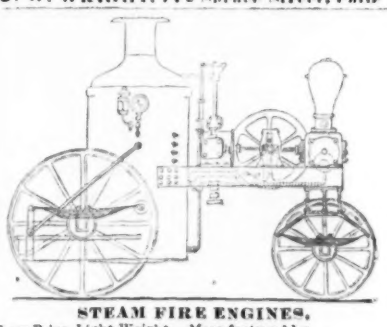

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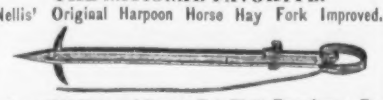
Nellis' Original Harpoon Horse Hay Fork Improved.



Over 1000 State and County Fair First Premiums. Endorsed by over 100,000 farmers. Convincible evidence to all who use our Fork.

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Each are put to a test of 2000 lbs. before shipping. Their equal is not in the market: *i. e.* for economy, durability and convenience.

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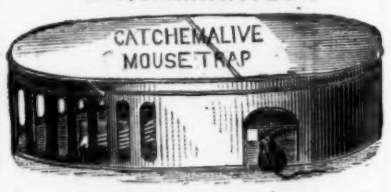
Every Mouse in the World to be EXTERMINATED!



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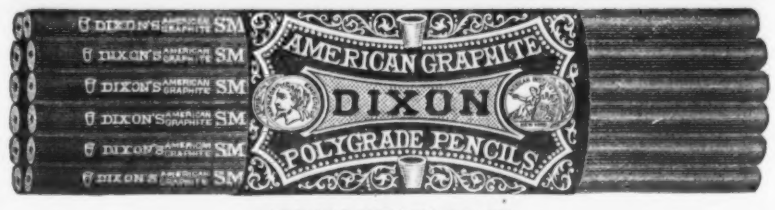

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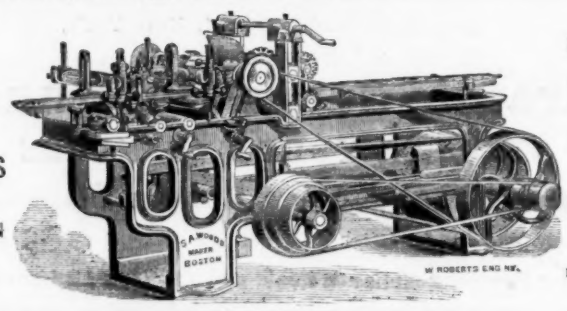

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